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TITLE: Threshold Effects and Social Norms May Hinder Gender Diversity Efforts on U.S. Corporate Boards, Making "Twokenism" the New Tokenism

SHORT TITLE: Threshold Effects May Limit Gender Diversity

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ABSTRACT

Women remain underrepresented at the top echelons of organizations. Much research has attributed this underrepresentation to a combination of implicit and explicit biases against women and gender differences in preferences. We examine an underexplored potential cause: skewed perceptions of gender diversity which may limit opportunities for women. If organizations see gender diversity as a goal but tend to consider that goal satisfied once they match or just surpass the gender diversity levels of peers, then attaining true gender diversity may be jeopardized. We study this possibility in the context of U.S. corporate boards. Archival data analyses of 1,441 corporate boards from the S&P 1500 and S&P 500 reveal that boards are significantly and dramatically more likely to include exactly two women–a number that just exceeds the peer group average–than would be expected by chance, a phenomenon we refer to as "twokenism". This pattern is more pronounced for more valuable companies, which arguably face greater pressures to create the impression that they have achieved gender diversity. Laboratory data also reveal twokenism: individuals choose to add a female director to a corporate board with one woman at a discontinuously higher rate than to a board with zero, two, or three women. This choice is mediated by perceptions of the board's gender diversity, and perceived gender diversity only significantly increases when a board shifts from including one to two women. The gender diversity threshold effect we identify may hinder efforts to achieve meaningful gender diversity in organizations.

SIGNIFICANCE STATEMENT

We present evidence that diversity efforts in organizations may be relaxed once the goal of achieving similar diversity levels as peer organizations is attained. Archival data analyses show that corporate boards–particularly at more valuable companies–are disproportionately likely to include exactly two women–the average number of female board members included by peers. A laboratory experiment suggests including two women surpasses a key social norm threshold in a group's perceived diversity. Our findings indicate that perceptions of gender diversity can lead to social norm-based threshold effects that may hinder efforts to achieve meaningful gender diversity in organizations.

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Women remain underrepresented at the highest echelons of organizations: in 2013, only 4.6% of Fortune 500 CEOs were female, and only 16.9% of Fortune 500 board seats were held by women (Center for American Progress, 2014). Improving gender diversity at the highest levels of organizations has proven challenging (Richeson and Ambady, 2001; Castilla and Benard, 2010). As a result, policy makers, corporate leaders, and academics have devoted considerable attention and resources to understanding why underrepresentation persists, what its implications and consequences are (Woolley et al., 2010; Dasgupta and Asgari, 2004), and the best ways to address it (Dasgupta, Scircle, and Hunsinger, 2015; Shapiro, Williams, and Hambarchyan, 2013; Galinsky et al., 2015; Stephens and Levine, 2011). In this paper, we present empirical evidence of a previously unexplored contributor to the limited gender diversity in the highest echelons of organizations. Specifically, we highlight the possible role of gender diversity "threshold effects", whereby efforts to improve diversity decline precipitously after achieving a salient gender diversity goal. We study gender diversity threshold effects in the context of U.S. corporate boards, which control trillions of dollars and are some of the most influential institutions in the economy (Bainbridge and Henderson, 2014)

Extensive evidence suggests that many organizations consider achieving gender diversity to be a pressing goal (Bartels, Nadler, Kufahl, and Pyatt, 2013; Calvert Investments, 2015) and that board diversity, in particular, is an area of focus for numerous public companies (Colby, 2016; Bloxham, 2016). If achieving adequate gender diversity is indeed a goal that some groups–including corporate boards–strive to attain, how might treating diversity as a goal affect the gender diversity of boards? While goals are highly motivating (Locke and Latham, 2002), they can also have perverse effects. Past research has shown that individuals relax efforts after

reaching salient goal thresholds in many settings (Heath, Larrick, and Wu, 1999). Specifically, goals can serve as reference points, causing individuals to expend considerable effort in the hopes of achieving an unmet goal and then to relax their efforts after achieving it. This relaxing of effort has been shown to lead to performance clustering around salient goal thresholds in numerous contexts. For instance, professional baseball players finish seasons disproportionately often with a batting average just above .300 (a salient threshold widely believed to separate good hitters from great ones; Moskowitz and Weirtheim, 2011), and high school students are much more likely to retake the SAT if they score 990 compared to 1,000 (the average score set by the College Board[1] and a salient, round number; Pope and Simonsohn, 2011). Thus, if corporate boards set conscious or unconscious goals around gender diversity, we would expect to see a clustering of boards with exactly the number of women that constitutes a salient gender diversity goal threshold.

Where might a salient gender diversity goal threshold–consciously or unconsciously–be set? Past research suggests that social norms, determined by the average observed behavior of peers, frequently serve as reference points or goals (e.g., Goldstein, Cialdini, and Griskevicius, 2008; Nolan et al., 2008). Both those who outperform and those who underperform relative to a social norm are typically influenced to adjust their behavior and move towards the reference point the norm creates (Schultz et al., 2007). We propose that groups likely consider the diversity of their peers when setting their (conscious or unconscious) diversity goals. In particular, corporate boards may view the diversity levels of other boards as benchmarks that shape their gender diversity aims. Notably, past research has shown that perceptions of diversity can be fluid, depending both on absolute levels of representation within groups and on features of the observer and the context (Unzueta, Knowles and Ho, 2012; Unzueta and Binning, 2012;

[1] http://blog.prepscholar.com/what-is-a-good-sat-score-a-bad-sat-score-an-excellent-sat-score

Bauman, Trawalter and Unzueta, 2014). Many may thus *perceive* a discontinuous and substantial improvement in board diversity once the number of female board members surpasses the social norm set by other boards for female representation.

On S&P 1500 U.S. corporate boards, the average number of women is 1.36 (or 14.5% of directors; note that the average board includes 9.4 directors; 2013 ISS Directors Dataset), and the average number of women on boards in the even more widely-discussed S&P 500 is 1.92 (or 17.8% of directors with an average board size of 10.8 directors; 2013 ISS Directors Dataset). Since boards cannot have fractional numbers of women, two is the minimum number of women necessary to exceed the social norm on a board of typical size. We would thus expect the norm of including roughly two women on a typical ten person board to be a salient benchmark familiar to many corporations[2] and a likely goal (be it conscious or unconscious) for boards with diversity objectives. We would therefore expect corporate board gender diversity to cluster around the social norm of two female directors.[3] We refer to this hypothesized clustering at exactly two women as "twokenism". Further, if the diversity threshold effect we propose indeed exists on corporate boards and is produced by social norms, then it should be possible to predict a historical transition to "twokenism". Specifically, we hypothesize that the transition to twokensim (an overabundance boards with two female directors) from the more traditional "tokenism" (Kanter, 1977; an overabundance of boards with just one female member) should have occurred at roughly the time when the social norm shifted from boards including one woman or fewer to the current norm of more than one woman per board.

[2] A random sample of survey respondents on Amazon's Mechanical Turk also believed that the typical number of women on U.S. boards was two (see Study 2).

[3] While diversity goals may often arise in the form of percentages, in the context we study of U.S. corporate boards at S&P 1500 firms, absolute numbers are likely more salient than percentages due to the small numbers involved. Specifically, the range of board sizes is quite small, with 95% of boards containing between 6 and 14 members. In our supplementary analyses, we present tests confirming that the threshold effects we detect at absolute numbers are robust to the size of the board. Future research exploring diversity threshold effects in larger groups and looking at percentage effects would be extremely valuable.

Notably, impression management and diversity objectives are inextricably intertwined in organizations, and this is particularly true on corporate boards, which are frequently reprimanded by the media for failures to adequately diversify.[4] Past research has shown that goals exert a stronger influence on behavior when impression management concerns are greater (Hollenbeck, Williams and Klein, 1989) and that social norms serve as stronger reference points when impression management concerns are present (Cialdini and Trost, 1998). Thus, we would expect threshold effects to be more pronounced for groups that face greater public scrutiny and more impression management concerns. In our context, boards of more valuable companies tend to face more public scrutiny and greater impression management concerns (Smith, 2003), so we would expect to see more pronounced diversity threshold effects for more valuable companies.

We first present evidence supporting our twokenism hypotheses from simulation analyses based on data from 1,441 U.S. corporate boards of directors. Specifically, we demonstrate that (1) twokenism exists on U.S. corporate boards in the S&P 1500 and S&P 500, (2) twokenism emerged and supplanted tokenism when norms shifted such that an average board included more than one woman, and (3) twokenism is exacerbated for more valuable companies, which face greater impression management concerns. We then present evidence from a laboratory study that replicates twokenism and explores the perceptual mechanism underlying it.

Study 1

Overview. In Study 1, we conducted empirical analyses of S&P 1500 and S&P 500 corporate board composition data to test whether corporate boards exhibit gender diversity threshold effects at exactly two women (i.e. "twokenism") as we hypothesize. Our core analysis relied on a comparison between the actual distribution of male and female directors on corporate boards and the distribution we would expect if those directors were randomly assigned to boards. We

[4] Twitter, for example, came under media fire in 2013 for planning an IPO with an all-male board (Miller, 2013)

determined the expected distribution using a Monte Carlo simulation method (Rubinstein and Kroese, 2011). Specifically, we took existing 2013 S&P 1500 and S&P 500 data on directors and board seats and then randomly reassigned directors to different boards, generating 10,000 simulated distributions of directors to boards (see Study 1 Methods for details). Because we *randomly* reassigned actual directors to boards in each of our simulations, these simulations produced the board composition distribution we would expect to see if gender played no role in board member selection. In other words, given the available pool of board seats and directors, our simulations told us how many women we should expect to see on each board if boards ignored gender when choosing board members. This means that any differences we observed between our simulated distribution and the actual distribution of women on boards would be evidence that gender plays a meaningful role in director selection, and significant excess mass or clustering of boards at a precise number of women would provide evidence for gender diversity threshold effects.

To test for evidence that the historical transition from "tokenism" to "twokenism" occurred at roughly the time when the social norm shifted from boards including one woman or fewer to the current norm of more than one woman per board, we repeated our simulations using twelve years of historical data. We examined where and when we observed an excess of boards with exactly one female director (tokenism) versus exactly two female directors (twokenism) and if the timing of the transition to twokenism occurred when social norms shifted such that the average number of women on boards exceeded one, as we hypothesized.

To test for evidence that more valuable companies, which face greater public scrutiny, are more likely to exhibit twokenism, we explored whether twokenism is moderated by a company's market capitalization. Specifically, we repeated our simulations with sub-groups of

companies grouped by their market capitalization (e.g., the 100 companies with the highest market capitalizations, the 100 companies with the next highest market capitalizations, etc.). We then examined the extent of twokenism within each sub-group as a function of the group's average market capitalization, testing the hypothesis that companies with higher average market capitalization exhibit more twokenism.

Results and Discussion. Based on a comparison of actual S&P 1500 board data with simulated, gender-neutral board assignments, we found that boards with no women were underrepresented ($P < 0.02$), boards with exactly two women were overrepresented ($P < 0.01$), and boards including other frequencies of women arose at the frequency that would be expected given gender-neutral board selection procedures.[5] Similarly, for the S&P 500, as illustrated in Figure 1, there were 45% more companies with exactly two female board members ($P < 0.0001$) and 45% fewer companies with no female board members than we would expect ($P < 0.0001$), and boards including other frequencies of women again arose at the rate expected. Given the overrepresentation of companies with exactly two women on their boards, both analyses offer support for our hypothesis that gender diversity thresholds exist and support our hypothesis that this threshold arises at two women on U.S. corporate boards.

We conducted a number of supplementary analyses to corroborate our primary findings. First, we conducted placebo simulations using a characteristic of board members besides gender for which we would not expect to observe threshold effects (namely, ages ending in 3 or 4). We found that the frequencies of board members of these ages exhibited no deviations from simulated expectations.[6] These placebo simulations were identical to our primary simulations in every other way, suggesting that our results are not an artifact of our analytical method. Second,

[5] See supporting information for more details on our S&P 1500 simulations and for figure.
[6] See supporting information.

we conducted additional analyses to address the possibility that an assortative matching process of women to boards, whereby some types of companies (e.g. consumer products companies catering primarily to women) demand more female directors than others, could drive the phenomenon we detect, undermining the random assignment assumption in our simulations. We found that our effects are robust across industries (as well as across years of analysis, board sizes[7], the year of the company's IPO, and the gender of a company's CEO). Moreover, assortative matching should not lead to a discontinuous jump in exactly two women per board like the one we observe; it should instead lead to bimodal distributions of women on boards or an overall shift in the distribution of women.

We next turned to a test of our hypothesis that the shift from tokenism (the overrepresentation of boards with exactly one woman) to twokenism occurred when the average number of women per board crossed the one-woman threshold. We gathered additional archival data on the boards of directors of S&P 1500 companies and repeated our simulation strategy for each year from 2002 through 2013, determining the extent of overrepresentation of boards with one woman versus two women over time. We also looked at how the average number of women per corporate board changed over this time period. As illustrated in Figure 2, we found that twokenism emerged and tokenism declined precisely as the average number of women on boards crossed the threshold from less than one female director to more than one. Specifically, we ran an ordinary least squares regression with robust standard errors to predict the extent of twokenism or tokenism in each year as a function of whether the social norm for gender diversity exceeded one woman in that year. The regression showed that the social norm exceeding one woman was a significant positive predictor of twokenism ($\beta = 0.122$; $P = 0.002$) and a significant

[7] Even when we slice our data thinly and consider boards of only a certain size (e.g. all boards with 9 members), we find statistically significant twokenism for boards of size 9, 11, 12, and 13+, and we observe directional twokenism for boards of size 7 and 10.

negative predictor of tokenism ($\beta = -0.105$; $P < 0.001$). This finding supports our theorizing that the salient threshold for gender diversity–and thus where we would expect to observe threshold effects–is determined by the social norm for gender diversity.

Finally, we explored whether, as we hypothesized, twokenism is exacerbated for more valuable companies, which face greater impression management concerns and would thus be expected to feel more pressure to heed social norms. To test this hypothesis, we created sets of 100 companies grouped by their market capitalization and ran simulations to see how many companies in each set we would expect to include exactly two women on their boards compared to the actual number of companies in each set with exactly two women on their boards. We then conducted ordinary least squares regressions with robust standard errors to predict the extent of twokenism in each set (i.e., the *observed* number of companies with exactly two women on their boards minus the *expected* number of companies with exactly two women on their boards) using either the set's market capitalization rank (1 to 14) or the logarithm of the average market capitalization of the companies in the set. We found that larger companies are significantly and disproportionately more likely to have exactly two women on their boards (both *P's* < 0.001; see Figure 3), where an order of magnitude increase in a company's market capitalization is associated with a 34% increase in its chances of having exactly two women on its board.

Study 2

Overview. To better understand why twokenism occurs on corporate boards, we conducted a laboratory experiment featuring a stylized board member selection task. This experiment allowed us to test for a causal relationship between board composition and board member gender, to explore threshold effects in perceived gender diversity as a mechanism responsible for twokenism, and to examine how these threshold effects relate to observed social norms.

Importantly, our experiment was designed to examine basic psychological processes that may underlie diversity perceptions and decisions, not to emulate real-world board selection processes. If social norms produce goal-induced threshold effects in the pursuit and perception of diversity leading to twokenism on corporate boards, then in a population aware that corporate boards have two women on average, we should see that boards with two women are perceived to be discontinuously more diverse than others. We should also see that individuals are discontinuously more likely to add a female candidate to a corporate board in a stylized choice task when they are exposed to a board with exactly one current female director (so they can achieve the goal of a board including two women).

Our laboratory experiment included 624 Amazon Mechanical Turk ("MTurk") workers (45% female). To assess MTurk workers' beliefs about diversity norms on corporate boards, we ran a pilot study. Ninety-nine MTurk workers were asked how many women they thought served on a typical U.S. corporate board. The modal (n=29) response was two women, confirming that our study population was aware of true diversity norms on U.S. corporate boards

In our experiment, participants were shown ten names of members of a hypothetical corporate board, and random assignment dictated whether zero, one, two, or three of those ten names were female. In all four conditions, participants were asked to add an eleventh member to the board and were presented with three hypothetical candidates: a CEO, a board member from another company, or a consultant. One of these three candidates was randomly assigned a female name. After choosing a candidate, participants rated the gender diversity of the original ten-member corporate board.

Results and Discussion. As illustrated in Figure 4a, *perceived* gender diversity only significantly increased when a board shifted from including one to two women ($P < 0.0001$);

there was no significant difference in the perceived diversity of boards with zero women versus one woman (P = 0.596) or with two women versus three women (P = 0.706). In addition, participants shown a corporate board with exactly one female member were significantly more likely to choose the female candidate (and not the male candidates) for the open seat (*M* = 50.4%, SD = 0.502) than when participants were shown a corporate board with two female members (*M* = 36.0%, SD = 0.482; t(239) = 2.27, *P* = 0.024; see Figure 4b). To test for our hypothesized discontinuity in the likelihood of selecting a female candidate when a board included just one woman, and thus the existence of a threshold effect at the diversity social norm of two women, we ran a logistic regression to predict the likelihood of choosing the female candidate. We included as predictors both the number of women currently on the board (as a control) as well as an indicator for the one woman condition (our primary predictor of a discontinuity). Consistent with our hypothesis, individuals were discontinuously more likely to add a female candidate when there was only one woman on the board (β = 0.45, *P* = 0.035). Further, the perceived gender diversity of the board mediated the effect of seeing exactly one woman on the likelihood of choosing the female candidate: when perceived gender diversity, the number of women, and the indicator for the one woman condition were simultaneously used to predict whether the participant would choose the female candidate, the one woman condition was no longer a significant predictor (β = 0.39, *P* = 0.071), but perceived gender diversity predicted the selection of the female candidate (β = -0.21, *P* < 0.001). A bootstrap analysis showed that the 95% bias-corrected confidence interval for the size of the indirect effect excluded zero (0.002, 0.041), indicating a significant indirect effect of perceived gender diversity on the selection of the female candidate (MacKinnon, Fairchild and Fritz, 2007; Shrout and Bolger, 2002). This partial mediating effect of perceived gender diversity suggests that the twokenism phenomenon

is in part driven by a discontinuous improvement in the perceived gender diversity of boards once they have two women.

General Discussion

We hypothesized that U.S. corporate boards would exhibit gender diversity threshold effects, suggesting that corporations may (consciously or unconsciously) relax gender diversity efforts after achieving as much gender diversity as their peers. We based this hypothesis on past research demonstrating that people often reduce efforts to achieve goals after reaching salient thresholds and that social norms often serve as reference points or goals, particularly when concerns about impression management loom large (Cialdini and Trost, 1998). Our analyses of U.S. corporate boards provide robust evidence that our hypothesized gender threshold effect exists and that the threshold in question arises at two women on U.S. corporate boards–the smallest number that surpasses the social norm for gender diversity (i.e., the average number of women on peer boards). Specifically, we find that boards are disproportionately more likely to include exactly two women than would be expected by chance. Further, consistent with our theorizing, twokenism emerged as a phenomenon (and tokenism declined) when social norms shifted such that an average company included more than one woman on its board. In addition, companies we expect to face more public scrutiny regarding diversity–namely more valuable companies–are more likely to include exactly two female directors on their boards. We found corroborating evidence of the twokenism pattern in a stylized laboratory experiment demonstrating that individuals (who a pilot study confirmed were aware that two is the typical number of women on US corporate boards) were discontinuously more likely to add a female candidate when there was only one woman on the board, and this choice was partially mediated by perceptions of gender diversity.

Threshold effects at exactly two women on corporate boards of directors raise concerns given a number of findings from past research. First, it has been demonstrated that three women are necessary to reach a critical mass where boards will experience tangible benefits from gender diversity (Konrad, Kramer, Erkut, 2008; Torchia, Calabro, Huse, 2011). By stopping at two women, boards may be missing out on key benefits that can ensue from greater gender diversity. Second, homogeneous groups tend to be less objective and accurate (Apfelbaum, Phillips, and Richeson, 2014), and research on collective intelligence suggests that increasing the number of females in a group increases the group's collective intelligence (Woolley et al., 2012). Third, being a part of a duo in a group can be more stressful and isolating for women than being the sole woman (Loyd, White, and Kern, 2008). And finally, having two women on the average 10-person board falls far short of gender parity; twokenism suggests that boards may not be striving for ambitious levels of diversity[8].

This paper focuses on gender diversity on U.S. corporate boards, which are unique in many ways: they receive intense media scrutiny, are relatively small groups of roughly ten people, and are selected through opaque, highly competitive processes. We theorize that social norm based threshold effects for diversity are likely to arise in many other contexts.[9] However, more research is necessary to explore the full set of conditions under which threshold effects manifest themselves (e.g. what happens in groups with more than 14 members?) and to determine all of the factors that contribute to this phenomenon.

Materials and Methods

[8] In fact, participants in our laboratory study did not on average rate boards with two women above the midpoint of our 7-point scale, suggesting that boards with exactly two women are not perceived as adequately gender diverse.
[9] We also conducted simulations using race instead of gender and found no evidence of threshold effects. This is perhaps not surprising given that over 90% of the directors in our dataset are white, making it uncommon to observe even one racial minority on a board. Exploring threshold effects around race in another context with more racial diversity or larger groups would be a fascinating avenue for future research.

Study 1. Our dataset was compiled by Institutional Shareholder Services (ISS), formerly known as RiskMetrics, and accessed through Wharton Research Data Services on June 5, 2015. The ISS Directors Data that we analyzed includes information on the individual members of the boards of directors for each of the 1,514 companies in the S&P Composite 1500, including each director's name, gender, ethnicity, and a number of additional variables (see Appendix A for a full list of variables). The dataset is updated annually, and for our primary analysis, we relied on the 2013 data, as this was the most recent year of data available when we accessed the ISS database.

To test whether the distribution of women on corporate boards differs from what would be expected by chance, we first constructed a baseline or null distribution using the Monte Carlo method (Rubinstein and Kroese, 2011; Gino and Pierce, 2010) against which to compare the observed board compositions from the ISS Directors dataset. If boards were formed in an entirely unbiased way, we would expect that the observed distribution of women on boards in reality would correspond to the distribution produced by randomly assigning available directors in the ISS data set to available board seats. We ran 10,000 simulations to mimic such a random assignment scenario and compared actual (observed) board compositions in the ISS Directors Dataset to the mean and confidence intervals of the simulated board compositions.

In each simulation, we took as given the number of boards, the size of each board, and the number of board seats each director held based on the statistics that we observed in the 2013 ISS Directors Dataset. For example, if company A had nine board members in the ISS Directors Dataset, then in each simulation, company A ended up with nine distinct board members. Similarly, if director Z held two different board seats in the ISS Directors Dataset, then director Z ended each simulation holding seats on two different corporate boards.

For the process of randomly placing directors on boards, we used a stepwise algorithm. At step 0, no directors had been placed on any company board, and each director was represented x times in our pool of unassigned directors, where x is the number of different board seats he or she held in the ISS Directors Dataset. At step *i*, we considered company *i*, which has a board of size *n* in the ISS Directors Dataset, and we selected *n* directors at random from the remaining pool of unassigned directors. We verified that this was a viable board (i.e. that no director had been selected multiple times to serve on the same company board), and if so, we assigned the selected directors to this board and removed those selected director observations from the remaining pool of unassigned directors (e.g., if director *k* belonged to three boards in the ISS dataset, after he or she was assigned to his or her first board in a simulation, he or she would then only be present two times in the pool of unassigned directors). If the randomly selected board was not viable (because the same director was selected for more than one seat on that board), then we put the selected directors back into the pool and tried again with a new random selection of directors. If we ended up in a situation where there was no possible viable selection of directors for the current company board from our remaining pool of directors, then we aborted the current simulation and restarted the entire process. This algorithm repeated for each company until we successfully assigned the correct number of directors to all company boards.

After running this simulation 10,000 times, we had 10,000 random assignments of all directors to all boards that reflected the same number of directors, number of boards, and the same board sizes that we observed in the ISS Directors Dataset. For each simulation result, we considered how many company boards were assigned zero female directors, one female director, two female directors, etc. We then calculated the mean of these values across all 10,000 simulations. These means tell us how many companies we would expect, on average, to observe

with exactly zero, one, two, and so on female directors if available board seats in the ISS dataset were randomly assigned to available directors. Our simulations also tell us how rare a given assortment is, giving us bounds in the form of confidence intervals around each mean to indicate the likelihood under random assignment that we would observe a certain fraction of boards containing a specific number of women (e.g. in what fraction of 10,000 simulations we obtained such a result). Because our simulation method takes actual board data as input, the sum of deviations of the actual distribution of women on corporate boards from these simulated expected values must be zero by definition.

To test our hypothesis regarding the emergence of twokenism (and decline of tokenism) due to changing social norms for gender diversity, we repeated this simulation method on annual S&P 1500 board composition data going back to 2002. These simulations allowed us to identify when twokenism emerged as a phenomenon and examine how the social norm for gender diversity–or the average number of women on S&P 1500 boards in each year–relates to twokenism. To test our hypothesis regarding the moderation of twokenism by company market capitalization, we repeated this simulation method on subsets of 2013 S&P 1500 boards grouped by companies' market capitalization. These simulations allowed us to identify the extent of twokenism in each group as a function of the average market capitalization of its members.

Study 2. Six hundred and twenty-four U.S. participants were recruited through Amazon's Mechanical Turk to participate in a short online research study (55% male; 77% Caucasian). These participants were paid $0.25 for completing a survey that they were told would take approximately 5 minutes of their time. Participants provided informed consent, and the Institutional Review Board of the University of Pennsylvania approved all materials and procedures in our study.

Participants were asked to imagine that they had been tasked with helping a company select a new member for its board of directors. They were then exposed to a list of ten names and told that the current board consisted of the individuals on that list. Participants were randomly assigned to one of four key experimental conditions where zero, one, two, or three of the names of board members were female (hereafter referred to as the *zero women condition*, the *one woman condition*, the *two women condition* and the *three women condition*).

To generate the names of the hypothetical board members, we randomly matched 44 first and last names drawn from the pool of actual first and last names of board members in the 2013 ISS dataset. We ran a pretest of these 44 names with 51 Mechanical Turk participants to ensure that each name was gender unambiguous. Specifically, the participants in our pre-test were asked to "Please rate the following names based on whether you think the name sounds male or female" and were then exposed to each of the 44 candidate names. Participants agreed at a rate of 98% or higher on the gender of 43 of the 44 names tested, and these 43 names were included in the pool of names of board members and board candidates presented in our primary survey.[10]

After participants in our primary survey were exposed to the pre-tested names of ten members of a board of directors, they were presented with three hypothetical candidates for an opening on the board in question and asked to choose one. The candidates were all described as qualified, but one was a CEO, one was a current board member at another company, and one was a consultant with expertise in the industry. For a random 25% of study participants–those in our *no gender* group–we named the three candidates Candidate A, Candidate B, and Candidate C to provide a baseline indication of the popularity of the CEO, board member and consultant. In the

[10] For each condition, we randomly selected the appropriate number of male names and female names from our pool of pre-tested names. For example, for the *one woman* condition, we randomly selected one female and nine male names from our pre-tested names and then randomly ordered the selected names. This was presented as one of three variations for this condition.

three other conditions (75% of participants), we randomly varied which candidate had a pre-tested female name (Jill Davis), and which candidates were bestowed with pre-tested male names (Matthew Anderson and Todd Miller). We presented three candidates for the available board seat rather than one male and one female to reduce suspicion that our study was about gender following Castilla and Benard (2010).

After selecting a candidate to add to the board, we asked participants to explain their choice of candidate in an essay-text box. We then asked participants to rate three statements adapted from Unzueta and Binning (2012) to gauge their perceptions of the gender diversity of the corporate board they originally viewed prior to the addition of a new board member. Participants used a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) to rate their agreement with three statements: (1) "This corporate board has a high degree of gender diversity"; (2) "I consider this corporate board to be gender diverse"; and (3) "This board has very little gender diversity" (reverse scored). The survey then proceeded to ask participants their gender, ethnicity, age, combined annual household income, highest level of education completed, years of full-time work experience, and hours currently worked per week. Finally, participants were exposed to a manipulation check, which asked them to recall how many men and how many women were present on the corporate board they had seen at the beginning of the survey. This check indeed confirmed that our manipulation was successful: participants recalled significantly more women on boards that included three women than two ($P < 0.001$), two women than one ($P < 0.001$), and one woman than zero ($P = 0.015$).

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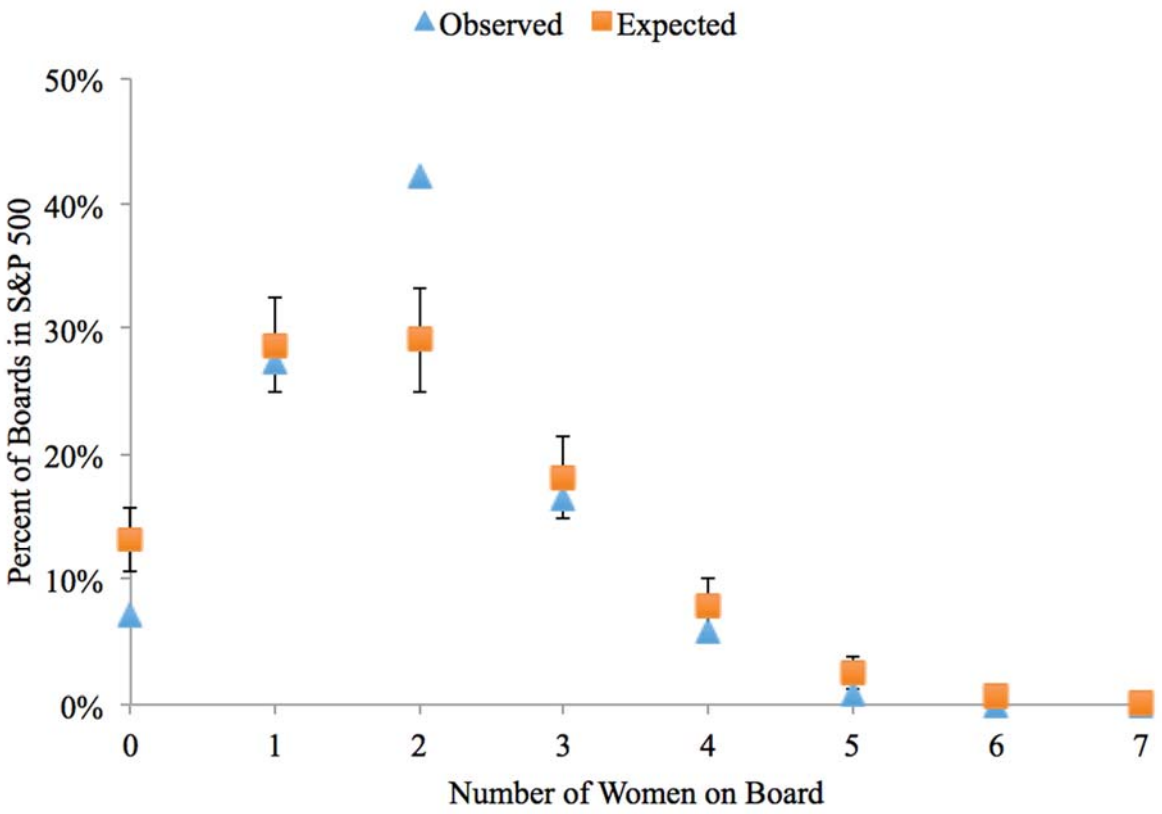
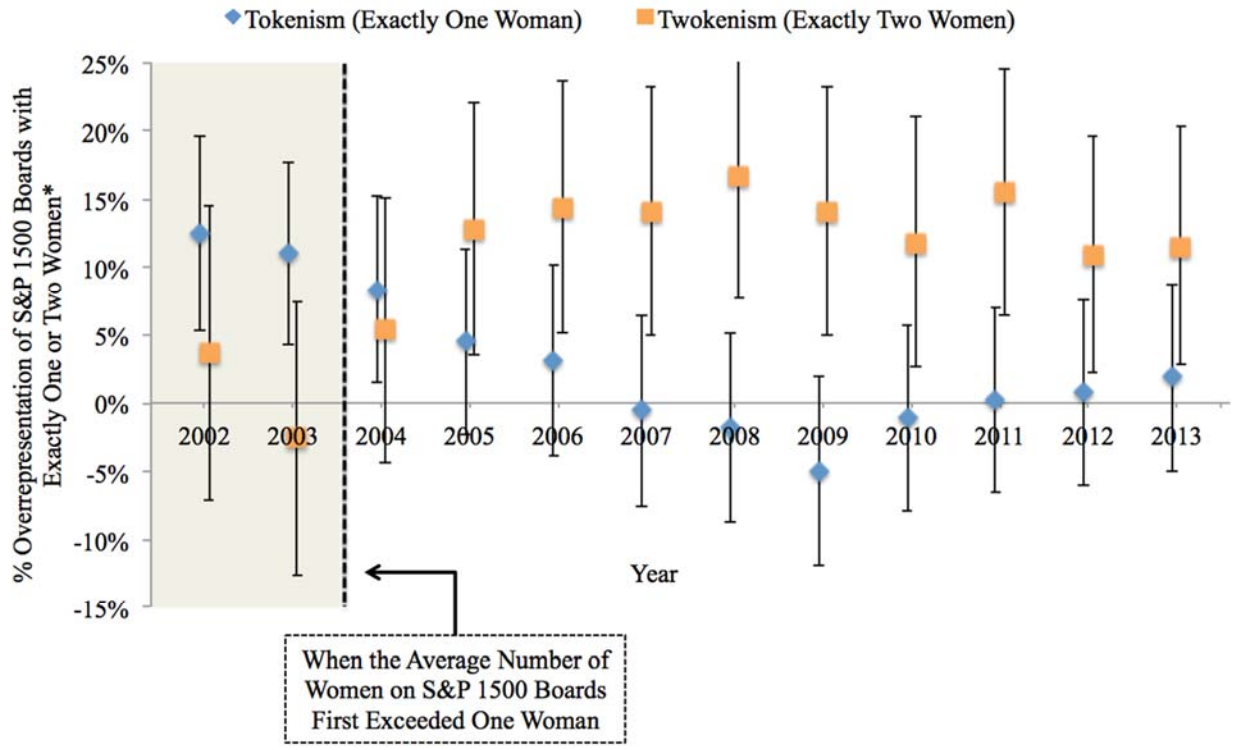
TABLES AND FIGURES

Figure 1. For the S&P 500, we compare the percent of boards observed with a given number of female directors to the percent of boards that would be expected by chance to include that number of female directors, in light of the available directors and director seats in the S&P 500 population as of 2013. Error bars depict 95% confidence intervals around expected percentages of boards with a given number of female directors based on simulations.[11]



[11] See supporting information for a parallel graph of S&P 1500 data.

Figure 2. This figure depicts the shift from "tokenism" (overrepresentation of boards with exactly one woman) to "twokenism" (overrepresentation of boards with exactly two women) in the S&P 1500 over time. The shaded region represents years where the average number of women per board fell below one. In 2004, the average number of women per board exceeded one for the first time, and this coincided with the emergence of twokenism and decline of tokenism. Error bars depict 95% confidence intervals around expected percentages of boards with a given number of female directors based on simulations.



* % Overrepresentation of S&P 1500 Boards with Exactly One Woman is calculated for each year using the following formula: [actual number of S&P 1500 boards with exactly one woman – expected number of S&P 1500 boards with exactly one woman] / [expected number of S&P 1500 boards with exactly one woman] where the expected number is calculated using our standard Monte Carlo simulation method. % Overrepresentation of S&P 1500 Boards with Exactly Two Women is calculated for each year using the following formula: [actual number of S&P 1500 boards with exactly two women – expected number of S&P 1500 boards with exactly two women] / [expected number of S&P 1500 boards with exactly two women] where the expected number is calculated using our standard Monte Carlo simulation method.

Figure 3. This figure shows differences between the expected number of boards with exactly two women compared to the actual number of boards with exactly two women across companies as a function of their market capitalization. Error bars depict 95% confidence intervals around the expected number of boards with exactly two female directors in a sub-population based on simulations.

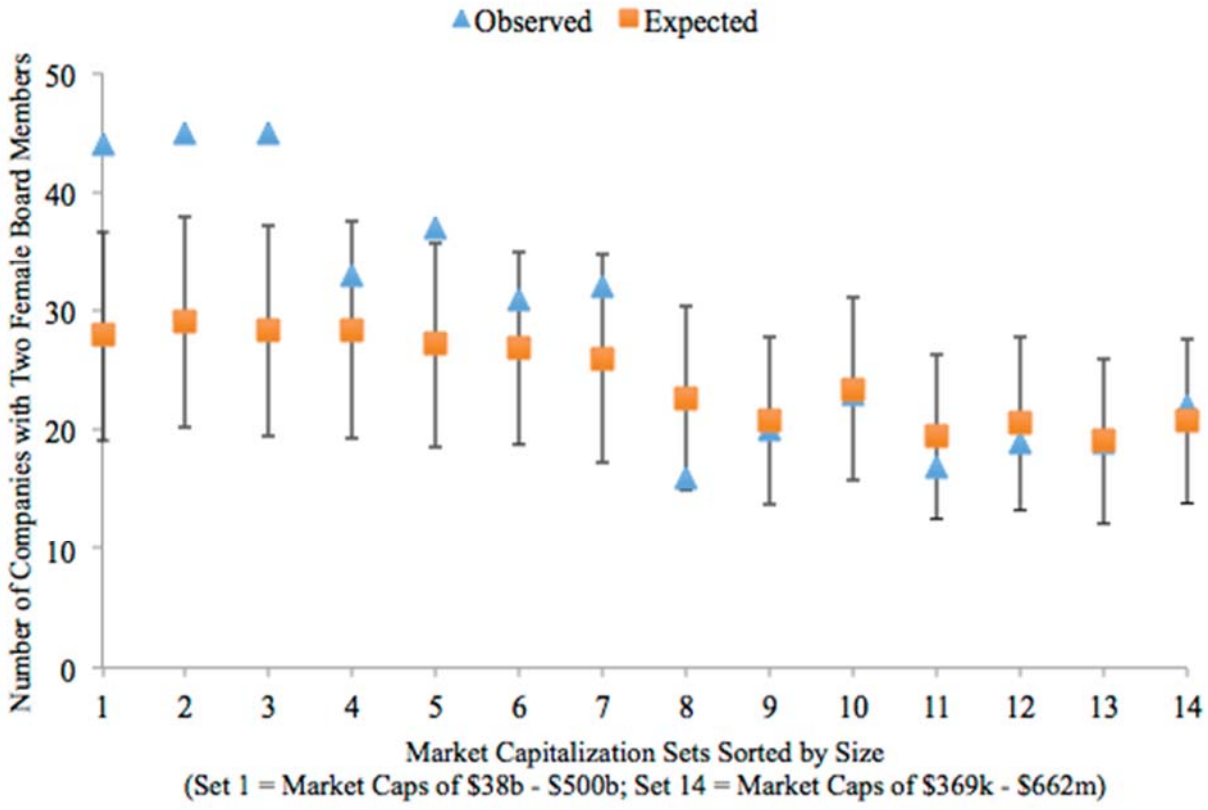
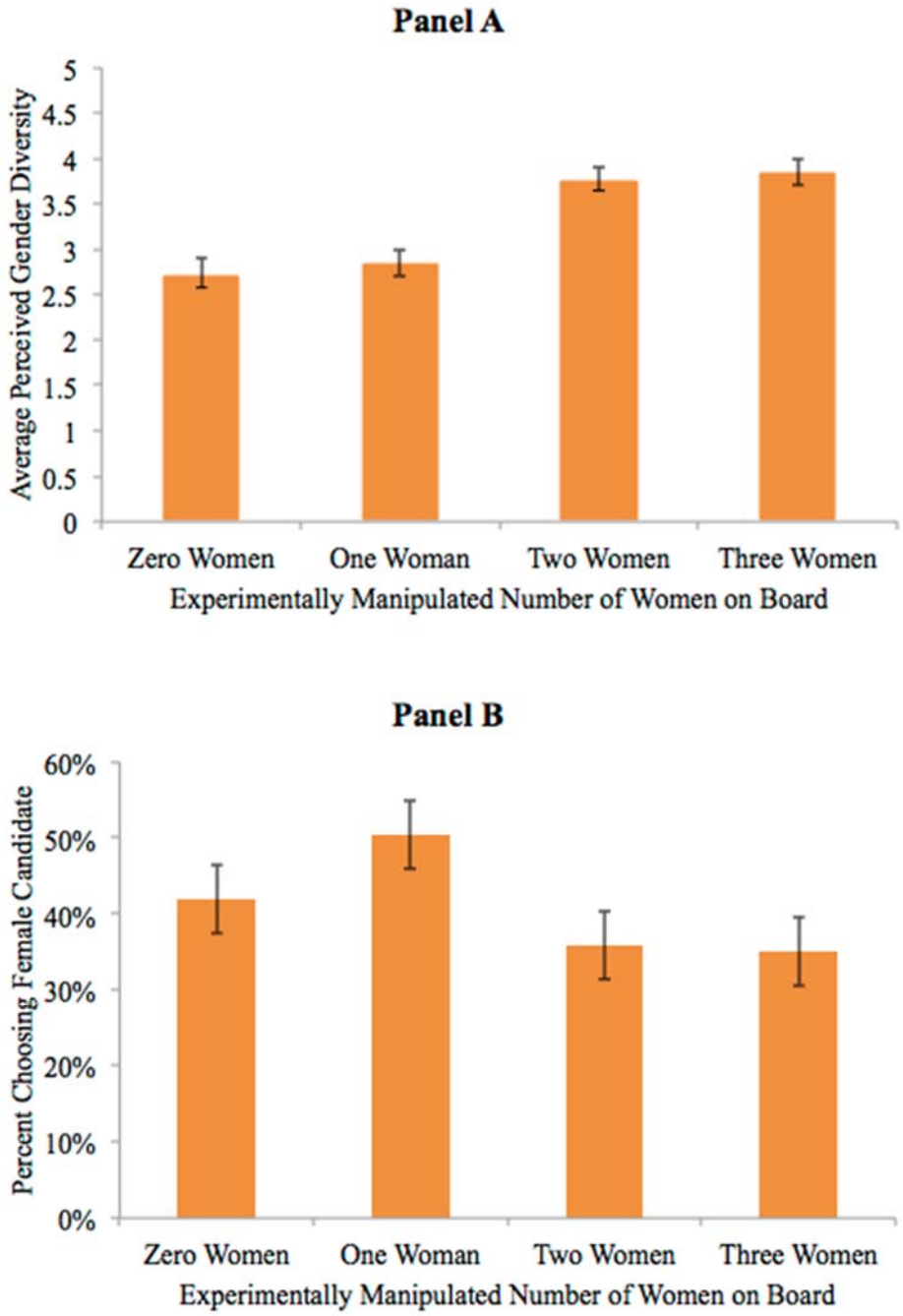


Figure 4. Panel A depicts participants' average ratings of the gender diversity of the board they initially viewed by experimental condition. Panel B depicts the percent of study participants who selected a female candidate for an open board seat by experimental condition. Error bars depict +/- 1 standard error.



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Supplementary Materials:

Table of Contents

ADDITIONAL DETAILS ABOUT MATERIALS AND METHODS

Overview

Our dataset was compiled by Institutional Shareholder Services (ISS), formerly known as RiskMetrics, and accessed through Wharton Research Data Services on June 5, 2015. The ISS Directors Data that we analyzed contains detailed information about the boards of directors for 1,514 companies that represent the S&P Composite 1500[12], which is composed of three indices: the S&P 500, the S&P MidCap 400, and the S&P SmallCap 600. These indices were created by S&P Dow Jones Indices–a joint venture among McGraw Hill Financial, the CME Group, and News Corp–to represent U.S. equity markets. Companies are added or removed from these indices by the U.S. Index Committee of S&P Dow Jones Indices. For inclusion in each of these indices, S&P Dow Jones Indices has explicit requirements around market capitalization ($5.3 billion or more for inclusion in the S&P 500; $1.4 billion to $5.9 billion for the S&P MidCap 400; $400 million to $1.8 billion for the S&P SmallCap 600), liquidity, domicile, public float, sector classification, viability, length of time as a public company, and type of security that constrain which companies can be added to one of these indices (S&P Dow Jones Indices, 2015). These requirements must be fulfilled at the time when a company is added to an index, but it is possible for a company included in one of these indices to remain despite no longer fulfilling all of the initial requirements. For instance, a company's market capitalization may change such that it no longer falls within the bands originally specified by the index.

The ISS dataset we analyze includes information on the individual members of the boards of directors for each of the 1,514 companies in the S&P Composite 1500, including each director's name, gender, ethnicity, and a number of additional variables (see Appendix S1 for a full list of variables). The dataset is updated annually, and for our primary analysis, we relied on

[12] https://wrds-web.wharton.upenn.edu/wrds/ds/riskmetrics/index.cfm Accessed on September 22, 2015.

the 2013 data, as this was the most recent year of data available to us as of June 5, 2015 when we accessed the ISS database.

Figure S1 depicts the distribution of the number of directors on each board for each company in our data set. The modal number of directors is nine, the median number is nine, the maximum is thirty-two, and the minimum is three. Given that we were interested in understanding the distribution of the absolute number of women on each board, boards with outlier numbers of seats could exert undue influence on our analyses. For our primary analyses, we therefore trimmed our dataset to include only companies with a total number of directors in the middle 95% of the distribution, excluding companies with outlier numbers of directors (i.e. fewer than six or more than 14) and leaving us with 1,441 companies to analyze. However, the results of our analyses remain meaningfully unchanged in terms of magnitude and statistical significance if we repeat them without trimming these outliers (see *Robustness Checks*).

The 1,441 companies in our trimmed data set included 13,440 distinct board seats and 11,185 distinct directors, as some directors held board seats on multiple company boards. In our trimmed dataset, 84% of directors held exactly one board seat; 13% held two board seats; 3% held three board seats; and less than 1% held four or five board seats (see Table S1). Table S2 depicts the demographic breakdown of the directors in our trimmed dataset. Of the 11,185 unique directors represented in our trimmed dataset, 14% (1,558) were female, and women held 15% (1,963) of the available board seats. Ninety-one percent (N = 10,150) of directors were Caucasian, 3.7% (N = 417) were Black, 3.0% (N = 335) were Asian, 1.7% (N = 192) were Hispanic, and 0.8% (N = 91) were classified as belonging to a different ethnic group. The average age of the directors in our trimmed dataset was 62.9 years with a standard deviation of 8.9 years (see Table S3). Fifty-eight (4.0%) of the companies had female CEOs.

Additional data on each company's market capitalization, industry, year of IPO, and percent of institutional ownership were also collected and used for robustness checks and investigations of moderators. We used data from the Center for Research in Security Prices downloaded on September 14, 2015 to obtain stock prices and shares outstanding as of December 31, 2013 to calculate year-end market capitalization for each of the companies in our dataset. In eight cases (for tickers: BIO, GEF, HVT, LEN, MKC, STZ, TAP, and WSO), there were duplicate entries for the same ticker symbol, so we verified the correct entry using historical price data from Google Finance. In 33 cases (for tickers: ARB, ARCB, BF.A, BLC, BRK.B, CBS.A, CLP, CNVR, CWTRQ, DELL, DOLNQ, FIRE, HUB.B, JW.A, KATE, KDN, LPT, LUFK, MFB, MOG.A, MOLX, NAFC, NVE, NYX, OMX, RUE, SHFL, SKS, SYMM, TLAB, TRLG, VLTR, and WBSN), the CRSP data did not include stock price information for companies in our original dataset, so we searched Google Finance for historical market capitalization data. In cases where this data did not exist for December 2013 due to the company being acquired earlier in 2013, we used the acquisition price as a proxy for the company's market capitalization. A breakdown of the market capitalizations in our dataset is presented in Table S4.

To classify each company in our ISS data into an industry group (e.g., Finance, Technology, etc.), we collected industry classification data from the NASDAQ's website on June 5, 2015[13]. For those companies in our original dataset where we did not find an exact match on the stock ticker symbol in the aforementioned NASDAQ dataset, a research assistant manually searched for company information on industry, which was obtained through multiple sources online such as Yahoo Finance, Google Finance, Bloomberg, and the websites of the companies

[13] http://www.nasdaq.com/screening/company-list.aspx

themselves. A breakdown of the industries of companies included in our dataset is presented in Table S5.

For IPO year, we used data from Bloomberg LP accessed via the Bloomberg Excel Add-In on October 28, 2015. For some companies, Bloomberg did not have a record of an IPO date, so we used the first date for which Bloomberg had pricing data for the company as a proxy for IPO date. In 28 instances (for tickers: ACT, ANR, ASBC, ATK, AVP, BF.A, BRK.B, BWS, CBS.A, COCO, FST, GE, GY, HUB.B, JDSU, JW.A, MOG.A, NU, PL, SPF, SPW, USMO, USTR, VPFG, WAG, WLP, ZMH, ZQK), Bloomberg had no data on IPO year or first pricing date (often due to the stock ticker no longer being used), so we determined the IPO date using data from news articles, company websites, and the NASDAQ.

Assessing the Validity of the Random Assignment Assumption

In our analyses, we compared the actual distribution of women on boards with the (simulated) distribution we would observe if men and women holding board seats in the relevant population of companies were instead randomly assigned to board seats, noting that this represents the null distribution where gender plays no role in board member selection. This is certainly an imperfect null, so we ran a number of diagnostic tests to assess the reasonableness of our random assignment assumption. First, we explored the assumption that directors are substitutable across boards in different industries. Specifically, we looked at directors who held multiple board seats to see how clustered directorships were within industries. Based on the number of companies per industry, we would expect that 89% of directors holding multiple board seats would hold board seats in more than one industry if board assignments were determined by random chance; we found that 82% of the directors holding multiple board seats in our dataset actually held board seats in more than one industry. This suggests that our

assumption that directors are substitutable across industries is actually reasonably accurate. To the extent that this assumption is inaccurate, we can address this inaccuracy by confirming that our results hold when we run our simulations within industries (see *Robustness Checks*).

Another questionable assumption is whether directors are substitutable across the boards of companies with different market capitalizations. To examine this, we looked at directors who held multiple board seats to see how clustered their directorships were across companies with varying market capitalizations. Rather than looking at a company's raw market capitalization, we ranked the market capitalizations of the 1,441 companies in our data set. If directors on multiple boards were randomly assigned to companies, we would expect that the average rank difference in market capitalization between the companies to which a single director was assigned should be 480. We observed that the average market capitalization rank difference between companies with a single director on the boards of both companies was 414 in our dataset. This again suggests that our assumption that directors are substitutable across companies regardless of their market capitalization is fairly reasonable. While there does appear to be a slight preference for holding board seats on related companies (i.e., companies in the same industry or with similar market capitalizations), this is not a strong trend. Again, to the extent that this assumption is inaccurate, we can address it by confirming that our results hold when we run our simulations within narrower market cap bands, which we do in Figure 3.

We also explored whether pairs of directors are more likely to serve on multiple boards together. For example, if directors A and B both serve on the board of company C, does that mean they are more likely to serve together on the board of company D? We considered all directors who served on multiple boards and looked at the boards on which they served. There were 8,058 pairs of directors where both directors served on the same board and both directors

served on multiple boards (not necessarily the same other board(s)). Of those 8,058 pairs of directors, 179 pairs of directors, or 2.2% of all pairs, served on two boards together. No pairs of directors served on more than two boards together. Thus, while pairs of directors do occasionally serve together on multiple boards, this is not very prevalent in our dataset.

Additional Information on the Analysis of the S&P 1500

Analyzing data from the S&P 1500 represents a more conservative test of our hypotheses than analyzing data from the S&P 500 given that companies in the S&P 1500 are generally under less public scrutiny than those companies in the S&P 500: the S&P 500 is one of the most commonly tracked stock market indices (e.g., the *Wall Street Journal*'s homepage tracks this index along with the DJIA, NASDAQ, Russell 2000, DJ Global Mkt and Global Dow[14]), and it represents 88% of the total market capitalization of the S&P 1500 and 80% of the total market capitalization of the U.S. stock market (S&P Dow Jones Indices, 2015). In addition, a Google search for the term "S&P 500" returns 400 times as many results as a Google search for the term "S&P 1500". Thus, companies in the S&P 1500 might have less reason to focus on board diversity than more well-known companies in the S&P 500 and thus might be less concerned with surpassing social norm-based thresholds for diversity. We presented a figure depicting the distribution of our primary simulation results including companies in the S&P 500 in the main manuscript in Figure 1; here, we present additional information on the S&P 1500 results. Figure S2 depicts the expected and observed number of companies with zero women, one woman, two women, etc. on their boards in the S&P 1500 in 2013.

Emergence of Twokenism and Decline of Tokenism

To test for evidence that the historical transition from "tokenism" to "twokenism" co-occurred with the shift in social norms such that a typical board included more than one woman

[14] www.wsj.com accessed on December 17, 2015.

(rather than one or fewer), we repeated our simulations using twelve years of historical data. We gathered additional data on the board composition of S&P 1500 boards from 2002 to 2012 from the RiskMetrics Directors Legacy dataset (for the years 2002 to 2006) and the ISS (RiskMetrics) Directors dataset (for the years 2007 to 2012) on August 22, 2016. Data captured prior to 2002 in the RiskMetrics Directors Legacy dataset appear to have substantial variation in data quality and reliability, which is why we began our analyses in 2002. The social norm for gender diversity (or the average number of women per board) in the S&P 1500 in 2002 was 0.917 women per board, and the social norm increased slowly over the time frame we analyze, surpassing the one-woman threshold for the first time in 2004 (with an average of 1.02 women per board in that year). Thus, analyzing board data from 2002 to 2013 provided an opportunity for us to test our hypothesis that social norms pertaining to gender diversity determine where threshold effects arise. We hypothesize that when the social norm is below one woman per board, we should observe tokenism, since including only one woman on a board allows a company to exceed the social norm for gender diversity. However, when the social norm exceeds one woman per board, we should observe "twokenism", since a board must now include two women to exceed the social norm for gender diversity.

For each year from 2002 to 2012, we repeated our simulation strategy to calculate how many boards would be expected to include exactly one or exactly two female directors and then we compared these simulation-based expectations to the number of boards we actually observed with exactly one or exactly two female directors. This enabled us to calculate the overrepresentation of boards with exactly one female director (i.e. tokenism) as well as the overrepresentation of boards with exactly two female directors (i.e. twokenism) in each year by taking the observed number of boards minus the expected number of boards in a category and

dividing this difference by the expected number of boards in the category. Our simulation strategy also provided confidence intervals around these expectations, allowing us to determine whether we saw statistically significant tokenism (overrepresentation of boards with exactly one woman) or twokenism (overrepresentation of boards with exactly two women) in any given year.

Our results are shown in Figure 2 in the main manuscript. In 2002 and 2003, the social norm for gender diversity–or the average number of women per board–was less than one woman, and we see statistically significant tokenism in these two years. We do not find statistically significant twokenism in these years, however. From 2005 to 20013, the social norm for gender diversity exceeded one woman, and we see statistically significant twokenism in these years. We do not find statistically significant tokenism in these years, however. In 2004, the first year that the social norm for gender diversity exceeded one woman in the S&P 1500, we still observe statistically significant tokenism and do not yet find statistically significant twokenism. When we ran a least squares regression with robust standard errors to predict the extent of tokenism (or the overrepresentation of boards including one woman using the formula described in the previous paragraph) or twokenism (or the overrepresentation of boards including two women using the formula described in the previous paragraph) in each year as a function of whether the social norm for gender diversity exceeded one woman in that year, we found that the social norm exceeding one woman was a significant *negative* predictor of tokenism ($\beta = -0.105$; $P < 0.001$) and a significant *positive* predictor of twokenism ($\beta = 0.122$; $P = 0.002$). This supports our hypothesis that twokenism emerged and tokenism declined when the social norm for gender diversity shifted. This also supports our more general theorizing that social norms help determine salient thresholds for diversity.

Market Capitalization as a Moderator

To test our hypothesis that the market capitalization of a company moderates the likelihood that the company's board includes exactly two women, we ordered the 1,441 companies in our 2013 S&P 1500 dataset by market capitalization and created bins of 100 companies (e.g. the first bin contains the top 100 companies in our dataset ranked by market capitalization; see Table S6 for descriptive statistics of bins). Because we were dividing the 1,441 companies into groups of 100 and 1,441 is not divisible by 100, the last bin by market capitalization contained 41 "extra" companies. We also reran these analyses using bins of size 72 (~1,441/20) and 144 (~1,441/10) to ensure that the size of the division we selected did not bias our results and that the uneven size of one bin (due to 1,441 not being evenly divisible by 100) did not affect our results. We found no differences using bins of different sizes (these supplemental analyses are available from the authors upon request).

After segmenting the companies in our dataset by their market capitalizations, we repeated our simulation strategy but limited each simulation to include only the companies in a given bin of ~100 companies. This allowed us to determine how many companies we would expect to see with exactly two women on their boards in each of the 14 market capitalization bins. We ran 1,000 simulations for each bin, generating a new expected number of companies with exactly two women directors each time. Thus, for each bin of 100 companies, we generated an *expected* number of companies with exactly two women on their boards based on our simulations and we could compare this with the *observed* number of companies including exactly two women on their boards in our 2013 ISS data.

To test the hypothesis that the likelihood of having exactly two women on a company's board goes up as a company's market capitalization increases, we ran four different ordinary least squared (OLS) regressions with robust standard errors, which are presented in Table S7.

First, we ran an OLS regression to predict the absolute difference in the observed versus the expected number of companies with two women on their boards in a given bin where our primary predictor was the bin "rank" (i.e. 1 = the bin with the 100 companies with the largest market capitalizations; 14 = the bin with the 141 companies with the lowest market capitalizations). The results of this regression are depicted in Table S7, Model 1. We find that the bin rank is a significant predictor of the absolute difference between the observed versus the expected number of companies with exactly two women on their boards ($\beta = -1.452$, $p = 0.000284$), such that companies with higher market capitalizations (i.e. lower numbered bins since bin #1 is the bin including companies with the highest market capitalizations) have larger absolute differences. Next, as depicted in Table S7, Model 3, we ran an OLS regression to predict the percent difference between the observed number of companies with two women on their boards and the expected number of companies with two women on their boards in a given bin where our primary predictor was again the bin "rank" (1 to 14). Again, the bin rank is a significant predictor of the percent difference between the observed and expected number of companies with exactly two women on their boards ($\beta = -0.0522$, $p = 0.000433$) where bins representing companies with higher market capitalizations have a larger percent difference.

To bolster our hypothesis that market capitalization is a moderator of twokenism, in two additional regressions, we repeated these analyses but used the logarithm of the average market capitalization of companies in a given bin (hereby referred to as "log market cap") as our primary predictor variable instead of the bin "rank". In Table S7, Model 2, we present an OLS regression to predict the absolute difference between the observed and expected number of companies with exactly two women on their boards in each bin using the log market cap of each bin as our predictor. The log market cap of the bin is a significant predictor of the absolute

difference between observed and expected boards with exactly two female directors ($\beta = 9.445$, $p = 0.000128$). The positive coefficient of log market cap indicates that bins containing companies with larger market capitalizations are more likely to have more companies that have exactly two women on their boards than would be expected. For Model 4, we used the log market cap of each bin of 100 companies to predict the percent difference between the observed and expected number of companies with exactly two women on their boards. The log market cap of each bin was a significant predictor of the percent difference ($\beta = 0.339$, $p = 0.000189$), indicating that bins of companies with higher market capitalizations have higher percent differences between the observed and expected number of companies with exactly two women on their boards.

As further robustness checks of this moderation of twokenism by market capitalization, we also tested whether regressions based on individual simulation outputs would show statistically significant coefficients for each of our market capitalization predictor variables (bin number and average log market cap for the bin). For each simulation across each bin of companies (e.g. using simulation 1 for bin 1, simulation 1 for bin 2, …, simulation 1 for bin 14), we ran four regressions mimicking the regressions listed in Table S7. In other words, using our simulation outputs, we ran a bootstrap to replicate each of the regressions listed in Table S7. Because we ran 1,000 simulations for each bin of 100 companies, we produced 1,000 regression outputs for each model. We then tested to see whether the coefficient of interest in each of these 1,000 regression was 1) directionally the same as our original regression coefficient reported in Table S7 and 2) statistically significant given the simulation output. For the first test, we would expect more than 50% of coefficients from the 1,000 separate regressions to be directionally consistent with our prediction (since 50% should be directionally consistent by chance). For the

second test, 5% of the coefficient p-values should be significant by chance, so we would expect more than 5% to actually be significant, suggesting we are detecting a signal rather than noise.

Our bootstrap analyses produced the following results. First, when we sought to replicate our prediction regarding the absolute difference between the observed and expected number of companies with exactly two women on their boards in each bin using bin "rank" as our primary predictor variable, 100% of our 1,000 simulations (vs. the 50% that would be expected by chance) yielded coefficients with the expected sign and 97% (vs. the 5% expected that would be expected by chance) yielded a statistically significant coefficient with a p-value of 0.05 or less. Our other specifications produced similarly strong results: predicting the percent difference between the observed and expected number of companies with exactly two women on their boards in each bin using the bin "rank" as the primary predictor variable yielded robust results (100% of simulations yielded coefficients with the expected sign and 81% of coefficients were significant at the 5% level); predicting the absolute difference in the number of companies with two women on their boards with a bin's log market cap as the predictor yielded robust results (99.9% of simulations yielded coefficients with the expected sign and 97% of coefficients were significant at the 5% level); and finally, predicting the percent difference with log market cap yielded robust results (99.9% of simulations yielded coefficients with the expected sign and 81% of coefficients were significant at the 5% level). These bootstrap replications provide additional evidence that market capitalization is a significant predictor of the overrepresentation of exactly two women on corporate boards.

Robustness Checks

We conducted numerous robustness checks to ensure that our results were not driven by outliers or by a small subset of boards by repeating our simulations for numerous different cuts

of our data. First, all of our analyses were conducted on the entire dataset without excluding companies with an outlier number of board seats. We repeated our simulation analysis for the S&P 1500, the S&P 500, and sets of companies sorted by market capitalization to replicate our moderation analysis. All reported results remain substantively the same (i.e. directionally the same and statistically significant), except that the underrepresentation of companies with no women on their boards is only marginally significant ($p = 0.073$) in the S&P 1500 when using the untrimmed dataset.

Next, we checked that our findings were robust to board size. Similar to our market capitalization analysis strategy, we used our simulation strategy limiting the data to boards of size 6 or fewer, 7, 8, 9, 10, 11, 12, or 13 or more. The underrepresentation of companies with no women on their boards and the overrepresentation of companies with exactly two women on their boards is robust across all board sizes tested (see Table S8). Specifically, we find statistically significant overrepresentation at exactly two women for boards of size 9 (i.e. 22% female), 11 (18% female), 12 (17% female), and 13+ (15% female or less), as well as directional overrepresentation at exactly two women for boards of size 7 (29% female) and 10 (20% female). When we look at the overrepresentation of boards with different proportions of female composition, we find that this overrepresentation arises on boards in the 15-30% female range. This 15-30% is mechanically analogous to overrepresentation at exactly two women given the limited range of board sizes that we observe (i.e. 95% of boards in our dataset have between 6 and 14 members). Although proportions of women are very clearly also important–and likely much more relevant and salient in large groups and groups that vary widely in size–we chose to focus on absolute numbers of women in our study of U.S. corporate boards for multiple reasons. First, these boards are small, and second, they are fairly uniform in size. As a result, absolute

numbers of women on boards are extremely salient. In addition, small changes in board size lead to large changes in women's percent representation. Thus examining absolute numbers of women in this context is a more straightforward and parsimonious way to explore threshold effects in gender diversity on corporate boards than examining percentages of women (which would require the construction of bins of indeterminate size). However, to extend this research to other domains and group sizes, considering representation in terms of percentages as well as absolute numbers would unquestionably be necessary.

Our results are also robust across industries. Using NASDAQ industry classifications (see *Data*), we reran our simulation analysis limiting ourselves to companies within each industry category: Basic Industries, Capital Goods, Consumer Durables, Consumer Non-Durables, Consumer Services, Energy, Finance, Healthcare, Miscellaneous, Public Utilities, Technology, and Transportation. Across all industries except for consumer non-durables and technology, we detect at least directional underrepresentation of companies with no women on their boards. For all industries except for consumer nondurables, health care, miscellaneous, and transportation, we see at least directional overrepresentation of companies with exactly two women on their boards (see Table S9). In only one case (the percent of boards with zero women for consumer nondurables) is there a statistically significant difference that goes against our main findings. The robustness of our findings across industries suggests that specific industries are not driving our effects.

We next looked at the ISS data from 2007 to 2013. Two thousand and seven is the first year in which ISS provided the format of Directors Data we analyze in this paper. For each year of available data, we reran our simulations on both the S&P 1500 and the S&P 500, trimming the companies in each year's dataset to exclude outliers due to board size (i.e. excluding companies

with board sizes smaller than six or greater than fourteen). In every year that we analyzed (2007 to 2013), the number of companies with exactly two women on their boards was greater than expected by chance in both the S&P 1500 and the S&P 500 (see Tables S10 and S11). While the number of companies with no women on their boards was less than expected for nearly all years in the S&P 1500, this underrepresentation was not statistically significant until 2013; on the other hand, the underrepresentation of companies with no women on their boards was large and statistically significant for all years in the S&P 500. In short, the main results we present from 2013 are robust when replicated with data from 2007, 2008, 2009, 2010, 2011 and 2012.

We also considered whether the gender of a company's CEO affects the likelihood that a company has exactly two women on its board. In general, the CEO of a company is also a member of its board of directors, so we might expect that companies with a female CEO (4.03% and 4.40% of the S&P 1500 and S&P 500, respectively) would have a number greater than two as its salient gender threshold. As shown in Table S12, we found a statistically significant overrepresentation of companies with exactly two women on their boards, regardless of the gender of the CEO. Thus, having a female CEO does not appear to eliminate the phenomenon we document.

We then examined whether the length of time the company has been public affects the likelihood that the company has exactly two women on its board. Similar to our strategy for testing the effects of market capitalization, we created bins of 100 companies grouped by IPO year. We then re-ran our standard simulation within each bin to determine how many companies within each bin we would expect by chance to have exactly two women on their boards. For more recent bins (i.e. for companies that have gone public more recently), there are slightly fewer companies with exactly two women than we would expect by chance, but none of these

differences is statistically significant (see Table S13). In general, our results appear to be robust regardless of when a company went public.

Placebo Simulations

To further validate our simulation strategy and ensure that our results are robust and not an artifact of the way we constructed an expected distribution of the numbers of boards including varying numbers of female directors, we conducted placebo simulations. Specifically, in these placebo simulations, we produced expected distributions of the number of boards including varying numbers of directors with another arbitrary characteristic other than being female. The arbitrary characteristic we selected was a director with an age ending in three or four as of 2013 (e.g., a director who was 53, 54, 63, 64, etc. as of 2013). This subpopulation was selected for placebo testing in part because it is similar in size to the subpopulation of female directors: there were 2,690 board seats (18.9% of the total number of seats in our S&P 1500 dataset) occupied by directors whose ages ended in three or four, roughly on par with the 2,054 seats or 14.5% of the total number of seats in our S&P 1500 dataset occupied by females. Furthermore, the demographics of the directors with ages ending in three and four as of 2013 are entirely representative of our overall director sample: women constituted 14.5% of this subpopulation, which exactly matches their representation in the overall director population, and Caucasians constituted 91.0% of this population (vs. 90.2% the overall director population). With this subpopulation, we repeated our simulation strategy, counting the number of directors whose ages ended in either three or four as of the end of 2013. In our placebo simulations, whose results are depicted in Figures S3 and S4, we see no significant deviations between the expected numbers of boards containing varying numbers of three-enders and four-enders and the actual, observed numbers of boards containing varying numbers of three-enders and four-enders. This remains

true both for simulations conducted on the S&P 1500 as well as for those limited to the S&P 500. Thus, as expected, simulations using an arbitrarily chosen characteristic show no deviations from expectations, suggesting that the large deviations we see for our simulations using gender are not an artifact of the way we have constructed our baseline expectations results.

Transition Probabilities

While the earliest data provided by ISS from 2007 already shows strong twokenism effects (see Tables S10 and S11), we would hypothesize that twokenism means boards will continue to gravitate slightly more towards including exactly two women than away from including exactly two women in order to maintain the twokenism tendency. To validate this expectation, we looked for all changes in board composition that involved female directors (i.e., any additions or departures of female directors) on an annual basis from 2007 to 2013. For each year that we observed a change for a board, we recorded how many women that board included prior to the change and how many women it included after the change. For example, if company A had no female directors at the end of 2008 and had two female directors at the end of 2009, we notated this as a shift from zero to two women on the company's board.

Figure S5 illustrates the transition probabilities we observe to and from the inclusion of exactly two women on a board. As is illustrated in the diagram, two women on a board seems to be a state that exerts more "gravitational pull" than other states, suggesting that boards may have a higher propensity to move towards twokenism than to move away from it. For example, when a board with one woman makes a change in its number of female directors, 64.4% of the time this change results in the board shifting to two women; on the other hand, when a board has two women and makes a change in its number of female directors, this change only results in the board shifting to one female director 42.2% of the time (producing an imbalance in inflows and

outflows that favors two female directors). This "gravitational asymmetry" is one of many depicted in Figure S5 that may reinforce twokenism.

Simulations Examining Ethnicity

We also conducted simulations exploring ethnicity as a distinguishing director characteristic instead of gender and found no threshold effects in these simulations (these analyses are available upon request). However, this is not at all surprising given that U.S. corporate boards include incredibly few racial minorities (see Table S2), making it uncommon to observe even one minority on a board and therefore difficult to see how threshold effects could plausibly arise. Even aggregating all non-Caucasians into a single group, non-Caucasians represent less than 10% of all directors in our S&P 1500 dataset. Exploring threshold effects involving ethnic minorities in another context with more racial diversity or larger groups would be a fascinating avenue for future research.

Alternative Explanations

Preferences of Female Directors. We suggest company or demand-side preferences drive the overrepresentation of companies with exactly two women on their boards, but it is possible that this phenomenon is driven by the preferences of female directors (or supply-side factors). Specifically, female directors could strongly prefer to serve on boards with exactly one other female director (although it seems unlikely that female directors would seek one female companion but be dissatisfied with two or three, which this explanation for our finding would require). Such a preference could lead women both to seek out companies with exactly one current female director and to prevent companies from adding additional women to a board beyond two once they have joined.

In addition to the logical implausibility of such a supply-side story, the fact that larger companies by market capitalization are more likely to have an overabundance of exactly two women on their boards is difficult to reconcile with a supply-side explanation but easy to reconcile with a demand-side explanation. Specifically, these findings regarding the moderating effect of company size suggest that companies under more scrutiny (due to their size or index membership) are more likely to aim for adequacy thresholds on their boards. If female director preferences were driving the effect, we would not expect that larger companies would be more likely to have exactly two women on their boards.

Laboratory Experiment

Through a laboratory experiment including 624 participants recruited through Amazon's Mechanical Turk,[15] we tested a potential psychological mechanism to explain the overrepresentation of corporate boards including have exactly two women. We investigated whether people are discontinuously more likely to choose to add a female candidate to a corporate board when there is just one woman currently on the board, and we examined whether perceptions of the gender diversity (or lack thereof) of the existing board drive this effect. See Appendix S2 for screenshots of survey materials.

Pilot Study. In a pilot study, we investigated whether members of the participant population included in our laboratory experiment were aware that two is the average number of women on U.S. corporate boards (i.e. two women is the social norm for gender diversity), which could help explain why threshold effects at two women or twokenism occur in our context.

[15] Our study completion rate among participants who began our survey was 83%, and this did not vary significantly by condition (all p-values from pairwise comparison between our four conditions are greater than 0.1). In addition, a one-way ANOVA testing the effects of condition on completion produces an F statistic of 1.04 ($p = 0.37$), suggesting that we do not observe differential attrition.

Ninety-nine U.S. participants (68% male) were recruited through Amazon's Mechanical Turk to participate in a short online research study. These participants were paid $0.10 for completing a survey that they were told would take approximately 1 minute of their time.

After consenting to participate in our pilot study, participants were told that the next screen would contain one question and that they would have 15 seconds to answer that question. We explicitly told participants we did not want them to look up the correct answer. On the next screen, participants were allotted 15 seconds to answer the following question: "How many women do you think serve on the board of a typical publicly traded U.S. company? (Note: 95% of publicly traded U.S. company boards include between 6 and 14 members, and the average number of people on these boards is 9.4)" We told participants the range of typical board sizes to give participants some context for providing reasonable answers (i.e. it would not be realistic for the typical board to have 10 or more women when the average number of people on a board is only 9.4).

The distribution of responses is illustrated in Figure S6. Excluding two participants who responded with an answer of 10 or more women (participants were told that the average number of people on a board was only 9.4, and responses of 8 or above were more than two standard deviations above the mean), the modal response (n=29) amongst all participants was 2 women and the median response was 2 women.[16] Thus, including two female directors appears to be the salient, perceived social norm for gender diversity on U.S. corporate boards among the population included in our laboratory experiment.

Main Study Results. First, our manipulation check revealed that our manipulation was indeed successful. Participants in the *zero women condition* who were exposed to a ten-person corporate board containing zero women recalled viewing a board containing significantly fewer

[16] We do not detect statistically significant differences in the average responses of male and female participants.

women than those in the *one woman condition* (M_{zero} = 1.07, SD_{zero} = 1.52; M_{one} = 1.88, SD_{one} = 1.61; t(249) = 4.09; p-value < 0.001) who in turn recalled viewing a board with significantly fewer women than those in the *two women condition* (M_{one} = 1.88, SD_{one} = 1.61; M_{two} = 2.66, SD_{two} = 1.42; t(239) = 3.95; p-value < 0.001) who in turn recalled viewing a board with significantly fewer women than those in the *three women condition* (M_{two} = 2.66, SD_{two} = 1.42; M_{three} = 3.09, SD_{three} = 1.22; t(226) = 2.45; p-value = 0.015).

We thus turned to testing our hypothesis that participants were discontinuously more likely to choose the female candidate when there was exactly one woman currently on the corporate board. There was no significant difference in the selection of the female candidate between the *zero women* and *one woman conditions* (M_{one} = 50.4%, SD_{one} = 0.502; M_{zero} = 41.9%, SD_{zero} = 0.495; t(249) = 1.34; p = 0.179), but there were significant differences between the *one woman* and *two women conditions* (M_{two} = 36.0%, SD_{two} = 0.482; t(239) = 2.27; p = 0.0241) as well as the *one woman* and *three women conditions* (M_{three} = 35.1%, SD_{three} = 0.479; t(239) = 2.41; p = 0.0165)[17]. To properly test our hypothesis, however, we need to test for a discontinuity in the rate at which female candidates are selected when there is exactly one woman on the board. In general, if there exists a motivation to increase gender diversity of corporate boards, participants should be more likely to select the female candidate when there are fewer women on the board. Therefore, it could be viewed as perfectly natural and unsurprising that participants are more likely to choose a female candidate for a board seat when there is one woman currently on the board than when there are already two or three women on the board. To test our distinct hypothesis that women are *discontinuously* more likely to be

[17] Comparisons to 1/3 or random assignment: zero condition t(123) = 1.94, p = 0.546; one condition t(126) = 3.84, p = 0.0002; two condition t(113) = 0.59, p = 0.556; three condition t(113) = 0.40, p = 0.691. There were no significant interactions by job type (F = 1.16, p = 0.325) or participant gender (F = 0.19, p = 0.901), but there was a main effect of both: the candidate labeled as the CEO was chosen most often regardless of gender, and female participants were more likely to select the female candidate. All patterns of results hold for both male and female participants.

selected when there is exactly one woman on an existing board, we ran a logistic regression to predict whether a woman is chosen for the open board seat in our experiment where we account for the expected linear relationship between the number of women on the current board and the likelihood of adding a woman by controlling for the number of women on the current board. To test our hypothesis that there is a discontinuity in the likelihood of selecting a woman when exactly one woman sits on the current board, we included our key predictor variable in the regression: an indicator variable for the *one woman condition*. As Table S14 shows, we found that after controlling for the number of women on the board, the *one woman condition* indicator variable was a large, positive and significant predictor of the likelihood of selecting a woman ($\beta = 0.454$; $p = 0.035$). Thus, we found support for our hypothesis that participants are discontinuously more likely to choose the female candidate when there is exactly one woman currently on the corporate board.

We next tested whether this discontinuity was mediated by participants' perceptions of the gender diversity of the corporate board for which they had been tasked with selecting a new member. We asked participants to rate three statements adapted from Unzueta and Binning (2012) to gauge their perceptions of the gender diversity of the corporate board they originally viewed prior to the addition of a new board member. Participants used a 7-point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) to rate their agreement with three statements: (1) "This corporate board has a high degree of gender diversity"; (2) "I consider this corporate board to be gender diverse"; and (3) "This board has very little gender diversity" (reverse scored). Across the three items we used to assess participants' perceptions of the gender diversity of the original corporate board they viewed, the Cronbach's alpha[18] was 0.93. Thus, we averaged these three items to create a single measure of perceived gender diversity ($M = 3.28$; $SD = 1.66$;

[18] Calculated after subtracting the reverse-coded item from eight.

higher scores indicate more perceived diversity). As depicted in Figure 4a, participants reported perceiving significantly higher average gender diversity in the *two women condition* than in the *zero women* or *one woman conditions* ($M_{zero,one}$ = 2.80, $SE_{zero,one}$ = 0.107; M_{two} = 3.78, SE_{two}= 0.131; t(363) = -5.41; p < 0.00001), which did not differ significantly from one another (M_{zero} = 2.74, SE_{zero} = 0.157; M_{one} = 2.85, SE_{one}= 0.145; t(249) = -0.53; p = 0.596). Further, perceived diversity remained flat in the *three women condition*, which differed insignificantly from the *two women condition* (M_{two} = 3.78, SE_{two}= 0.131; M_{three} = 3.85, SE_{three} = 0.143; t(226) = 0.378; p = 0.706)[19]. In other words, there was a discontinuity in perceived gender diversity that arose when the board climbed to two women. Analyzed another way, after controlling for the number of women on the board shown to study participants, the *two women condition* indicator variable is a large, positive and significant predictor of perceived gender diversity (β_{two_women} = 0.375; p = 0.035).

We then ran a mediation analysis specific to binary outcomes to see if perceived gender diversity mediated the discontinuous effect of the *one woman condition* on participants' likelihood of selecting the female candidate, controlling for the number of women on the original corporate board (Baron and Kenny, 1986). When controlling for the number of women on the board and including an indicator for the *one woman condition* in a logistic regression, perceived gender diversity was a significant predictor of selecting a female candidate for the board ($\beta_{gender\_diversity}$ = -0.21, p = 0.001). In addition, after controlling for perceived gender diversity, the effect of the *one woman* condition on selection of the female candidate decreased from 0.45 (p = 0.035) to 0.39 (p = 0.071). A bootstrap analysis with 500 replications revealed that the 95% bias-corrected confidence interval for the size of the indirect effect excluded zero (0.002, 0.041),

[19] There was no significant interaction by participant gender (F = 0.97, p = 0.408), but there was a main effect of participant gender: female participants perceived identical boards to be significantly less gender diverse than male participants. All patterns of results reported hold for both male and female participants.

indicating a significant indirect effect of perceived gender diversity on the selection of a female board member (MacKinnon, Fairchild, & Fritz, 2007; Shrout & Bolger, 2002). In other words, our mediation analyses confirm our hypothesis that the discontinuous positive effect of the presence of exactly one woman on a corporate board on participants' likelihood of selecting a female to fill an open seat on that board is driven at least partially by a parallel discontinuity in people's perception that the original board was gender diverse.

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FIGURES

Fig. S1. Distribution of the number of board seats across the entire 2013 ISS Directors Dataset.

Fig. S2. Comparing the percent of boards containing a given number of women based on our simulation results to the observed gender composition of boards using the trimmed 2013 ISS Directors Dataset on 1,441 companies, we find there are significantly fewer boards with exactly zero women and significantly more boards with exactly two women than would be expected by chance. Error bars depict 95% confidence intervals.

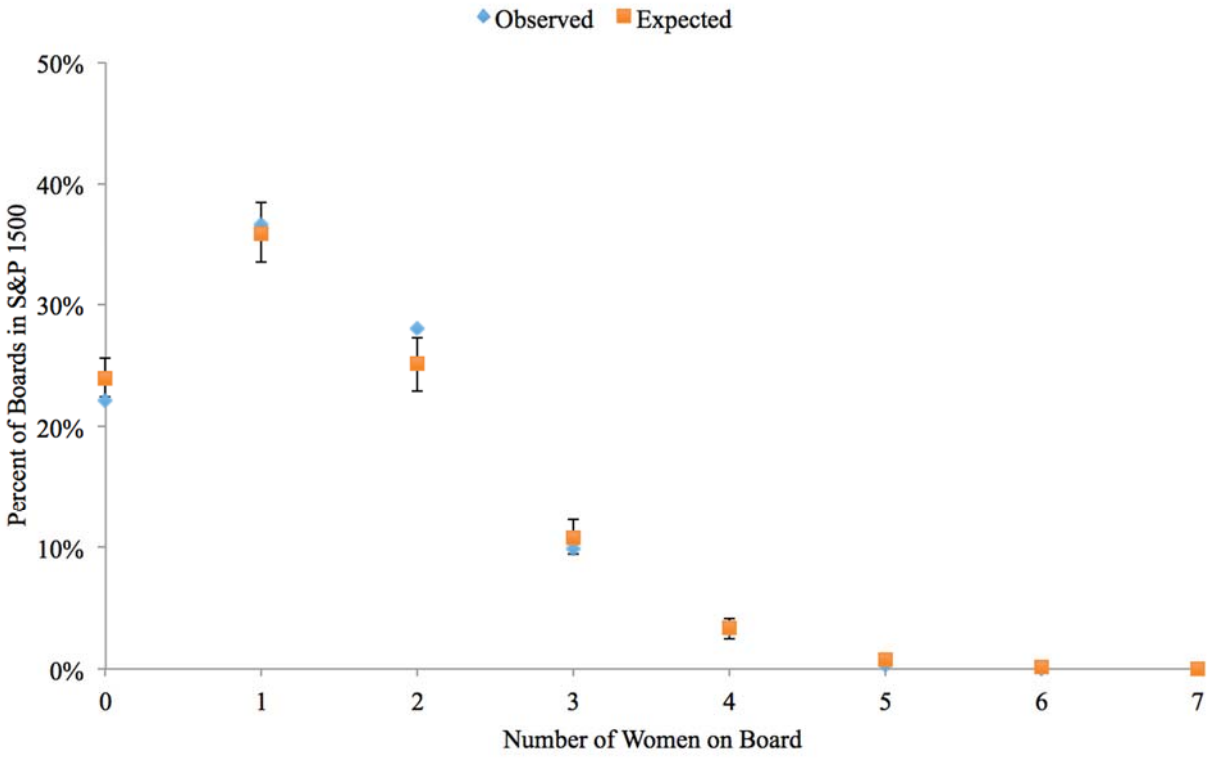


Fig. S3. Results from placebo simulations for S&P 1500. Comparing the percent of boards containing a given number of three- or four-enders based on our simulation results to the observed composition of boards using the trimmed 2013 ISS Directors Dataset on 1,441 companies, we find there are no significant deviations from simulated expectations for our placebo characteristic. Error bars depict 95% confidence intervals.

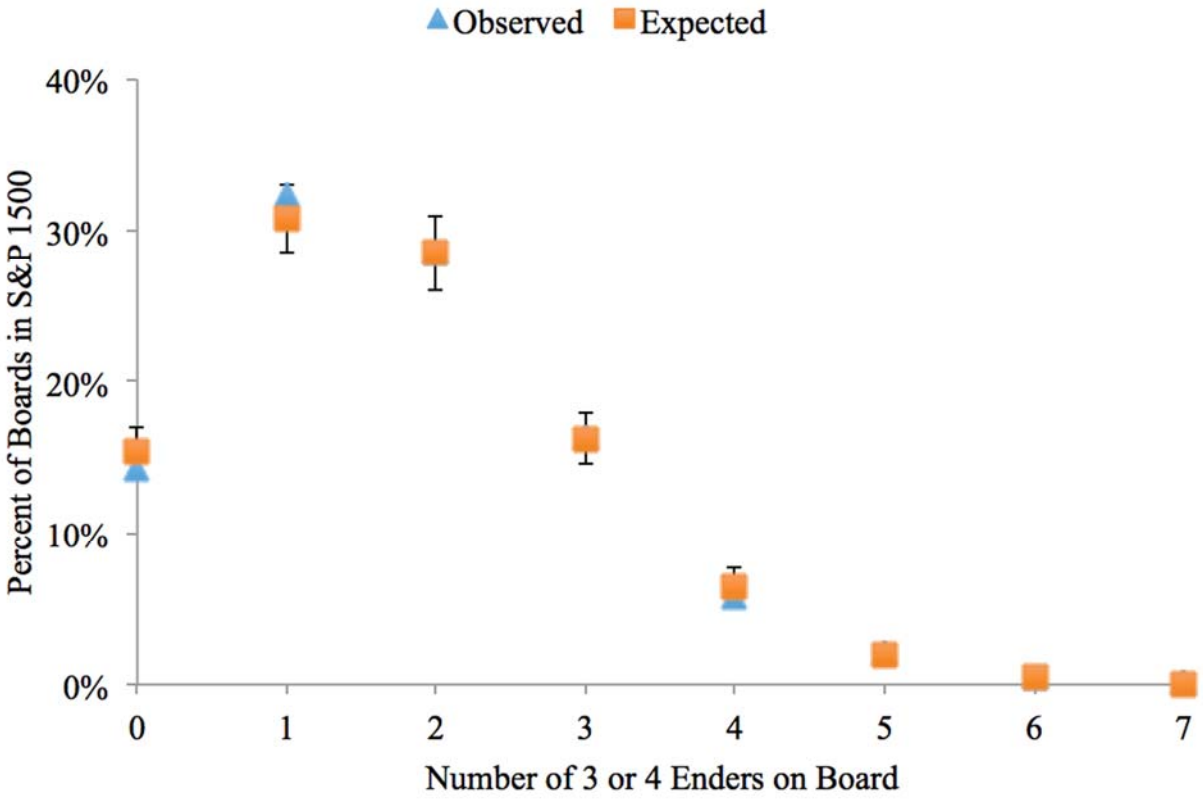


Fig. S4. Results from placebo simulations for S&P 500. Comparing the percent of boards containing a given number of three- or four-enders based on our simulation results to the observed composition of boards using the trimmed 2013 ISS Directors Dataset on 478 companies, we find there are no significant deviations from simulated expectations for our placebo characteristic. Error bars depict 95% confidence intervals.

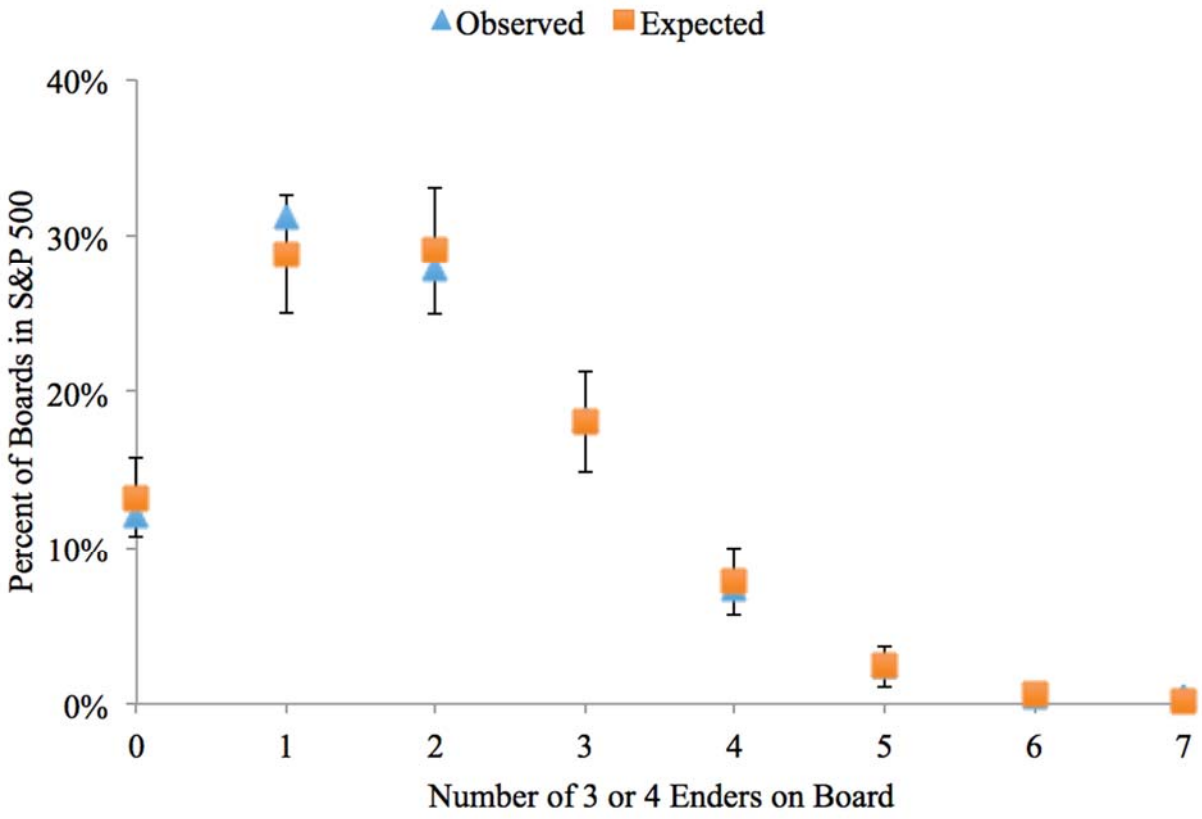


Fig. S5. Transition probability diagram depicting the proportion of yearly transitions from one "state" (i.e., number of female directors) to another from 2007 to 2013 whenever a board added or removed one or more female directors. This diagram focuses on transitions to and from the inclusion of exactly two women on a board, depicting the gravitational pull towards two, which presumably contributed to twokenism's stable presence in our dataset from 2007 to 2013.

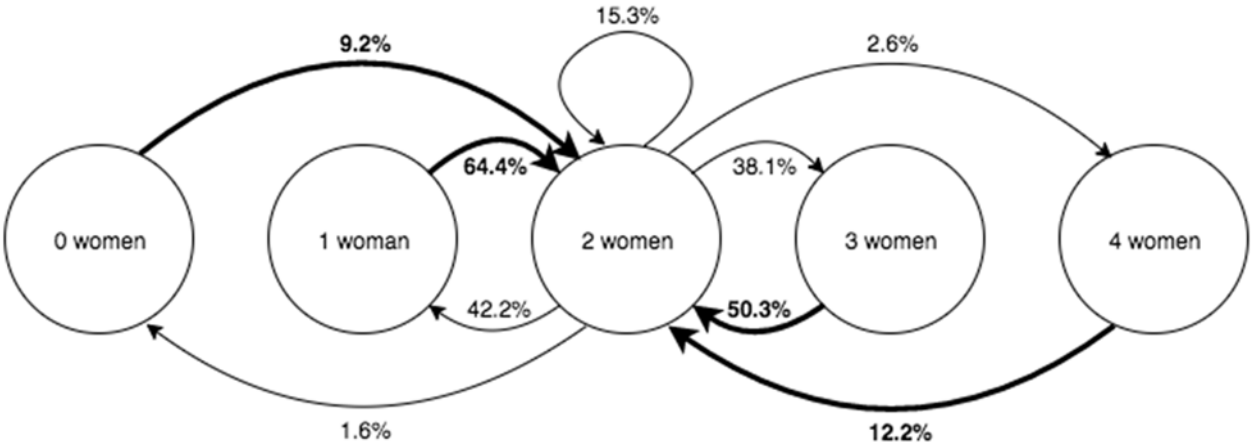
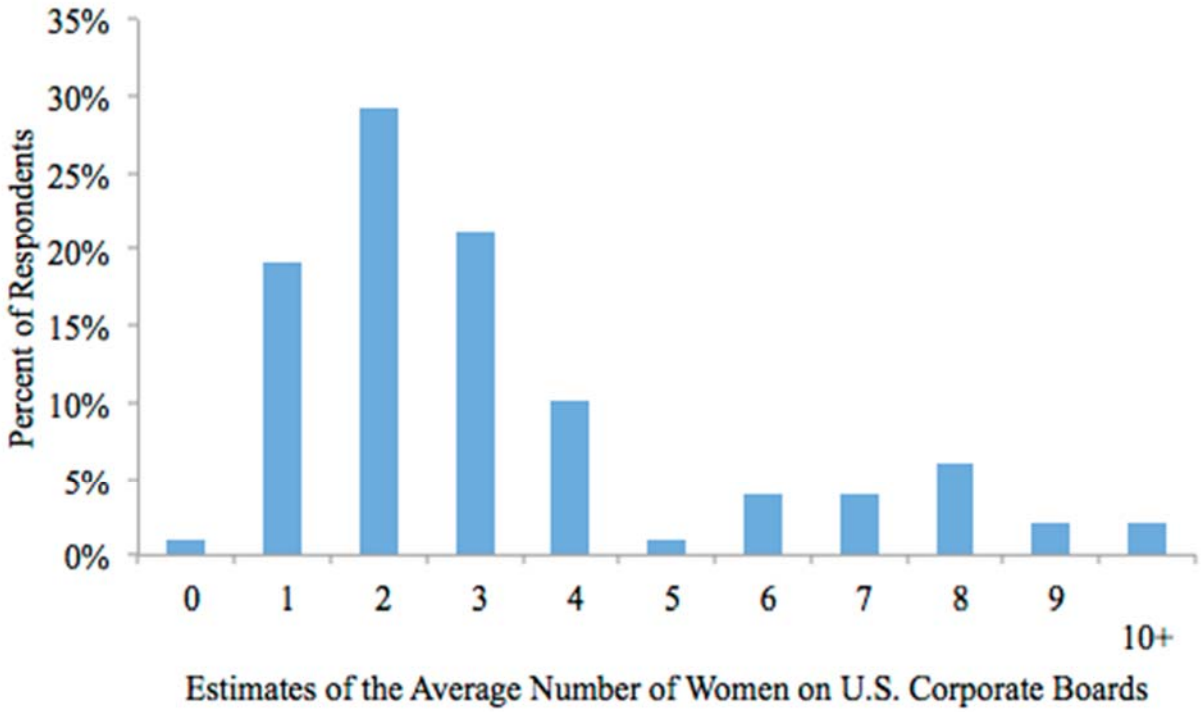


Fig. S6. Pilot study participants' estimates of the average number of women on U.S. corporate boards.



TABLES

Table S1. Number of board seats held per director in the trimmed 2013 ISS Directors Dataset.

Number of Seats Held	Number of Directors (% of Total)
1	9,346 (84%)
2	1,480 (13%)
3	310 (2.8%)
4	41 (0.37%)
5	8 (0.072%)
Total	**11,185 (100%)**

Table S2. Demographic composition of trimmed 2013 ISS Directors Dataset.

	Proportion of all Directors	Proportion of all Board Seats
Male	86%	85%
Female	14%	15%
Caucasian	91%	90%
Asian	3%	3%
Black	4%	4%
Hispanic	2%	2%
Other Ethnicity	1%	1%

Table S3. Age breakdown of directors in the trimmed 2013 ISS Directors Dataset.

Age	Number of Directors (% of Total)
Under 40	51 (0.46%)
40-49	617 (5.5%)
50-59	3,167 (28%)
60-69	4,757 (43%)
70-79	2,305 (21%)
80 and Over	256 (2.3%)
Unknown	32 (0.29%)
Total	**11,185 (100%)**
Average	**62.9 years**
SD	**8.89 years**

Table S4. Market capitalization breakdown of companies as of December 2013 from the trimmed 2013 ISS Directors Dataset.

Market Capitalization	**Number of Companies (% of Total)**
Under $1 billion	275 (19%)
$1 - 2 billion	272 (19%)
$2 - 3 billion	161 (11%)
$3 - 5 billion	187 (13%)
$5 - 10 billion	194 (13%)
$10 - 20 billion	162 (11%)
$20 - 50 billion	111 (7.7%)
Over $50 billion	79 (5.5%)
Total	**1,441 (100%)**
Mean	$12.8 billion
STD	$34.2 billion
Min	$369,000 (DOLNQ)
Max	$500 billion (AAPL)

Table S5. Breakdown of companies by NASDAQ-denoted industry from the trimmed 2013 ISS Directors Dataset.

Sector	**Number of Companies (% of Total)**
Consumer Services	249 (17%)
Technology	216 (15%)
Finance	187 (13%)
Capital Goods	137 (9.5%)
Health Care	125 (8.7%)
Consumer Non-Durables	103 (7.2%)
Basic Industries	101 (7.0%)
Energy	83 (5.8%)
Public Utilities	78 (5.4%)
Consumer Durables	68 (4.7%)
Miscellaneous	60 (4.2%)
Transportation	34 (2.4%)
Total	1,441 (100%)

Table S6. Descriptive Statistics for Market Capitalization Bins. This table presents descriptive statistics for each of the market capitalization bins used in the market capitalization moderation analysis. It also reports the expected number of companies with exactly two women on their boards based on simulations for each bin. To generate the bins, the companies in the trimmed 2013 ISS Directors Dataset were ordered by market capitalization and grouped into bins of size 100. Given that there are 1,441 companies total in the trimmed dataset, the last bin contains 141 companies.

Bin Rank (from highest to lowest market cap)	Number of Boards in Bin	Observed Number of Boards in Bin with Exactly 2 Female Directors	Expected Number of Boards with Exactly 2 Female Directors	Minimum Market Cap in Bin (in billions)	Maximum Market Cap in Bin (in billions)	Average Market Cap of Bin (in billions)
1	100	44	27.91	$38.276	$500.680	$104.781
2	100	45	29.06	$18.976	$38.196	$27.232
3	100	45	28.32	$12.827	$18.964	$15.737
4	100	33	28.40	$8.228	$12.808	$10.208
5	100	37	27.20	$5.820	$8.226	$6.969
6	100	31	26.89	$4.378	$5.803	$5.020
7	100	32	26.05	$3.330	$4.369	$3.880
8	100	16	22.64	$2.552	$3.329	$2.907
9	100	20	20.78	$1.956	$2.540	$2.252
10	100	23	23.45	$1.582	$1.953	$1.760
11	100	17	19.43	$1.170	$1.577	$1.346
12	100	19	20.55	$0.907	$1.164	$1.034
13	100	19	19.06	$0.666	$0.899	$0.774
14	141	22	20.74	$0.000[20]	$0.661	$0.416

[20] This company's market cap was $369,000.

Table S7. Regression Results from Market Capitalization Moderation Analysis. This table reports the results of robust OLS regressions in which the dependent variable is either 1) the absolute difference (i.e. number of companies) between the expected number of companies with exactly two women on their boards in each market capitalization bin based on simulations and the observed number of companies with exactly two women on their boards in each market capitalization bin or 2) the percent difference between the expected and observed number of companies in each market capitalization bin with exactly two women on their boards. In Models 1 and 3, the predictor variable is the rank of the market capitalization bin (#1 to #14 where #1 includes the 100 companies with the largest market capitalizations and so on); in models 2 and 4, the predictor variable is the logarithm of the average market capitalization of companies in each bin.

	Dependent Variable: Absolute Difference		**Dependent Variable: Percent Difference**	
	Model 1	**Model 2**	**Model 3**	**Model 4**
Bin rank	-1.452***		-0.0522***	
	(0.287)		(0.011)	
Log of average market cap in bin		9.445***		0.339***
		(1.705)		(0.064)
Observations	14	14	14	14
R^2	0.651	0.619	0.672	0.637

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S8. Board Size Robustness Check. This table reports the percent differences between the simulated expected numbers of companies with zero, one, two, or three women on their boards and the observed numbers of companies with zero, one, two, or three women on their boards (or the "excess percentage of boards observed with a given number of female directors") in the S&P 1500 in 2013 segmented by the size of the board with standard deviations based on 1,000 simulations reported in parentheses. Each board size was analyzed separately for simulation purposes, except that we grouped companies with 6 or fewer directors together and companies with 13 or more directors together to form adequately sized groups on which to run simulations.

Size of Board	Number of Boards	Excess Percentage of Boards Observed with 0 Female Directors	Excess Percentage of Boards Observed with 1 Female Director	Excess Percentage of Boards Observed with 2 Female Directors	Excess Percentage of Boards Observed with 3 Female Directors
6 or fewer	124	2.74%	-5.79%	-16.96%	37.36%
		(2.89%)	(11.23%)	(28.15%)	(109.43%)
7	199	-2.60%	4.38%	10.06%	-66.06%
		(3.34%)	(8.98%)	(16.79%)	(54.18%)
8	241	-15.98%**	23.15%**	-8.42%	-24.81%
		(5.57%)	(8.04%)	(11.18%)	(24.50%)
9	283	-26.32%**	14.16%*	20.60%*	-34.31%*
		(8.05%)	(7.22%)	(9.09%)	(14.04%)
10	235	-38.00%***	18.88%*	16.51%	-16.12%
		(10.85%)	(8.58%)	(10.14%)	(13.57%)
11	198	-50.56%***	6.67%	28.69%**	7.47%
		(14.71%)	(9.95%)	(10.95%)	(13.42%)
12	100	-76.36%**	-22.97%	64.40%***	-6.40%
		(28.08%)	(15.09%)	(15.38%)	(17.34%)
13 or more	134	-58.37%*	-20.70%	49.34%***	22.85%
		(24.01%)	(13.63%)	(13.10%)	(15.55%)

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S9. Industry Robustness Check. This table reports the percent differences between the simulated expected numbers of companies with zero, one, two, or three women on their boards and the observed numbers of companies with zero, one, two, or three women on their boards (or the "excess percentage of boards observed with a given number of female directors") in the S&P 1500 in 2013 segmented by the industry of the company with standard deviations based on 1,000 simulations reported in parentheses. Each industry was analyzed separately for simulation purposes.

Industry	Number of Boards	Excess Percentage of Boards Observed with 0 Female Directors	Excess Percentage of Boards Observed with 1 Female Director	Excess Percentage of Boards Observed with 2 Female Directors	Excess Percentage of Boards Observed with 3 Female Directors
Basic Industries	105	-0.54%	-11.17%	27.08%	-6.34%
		(12.54%)	(12.67%)	(16.38%)	(25.17%)
Capital Goods	144	-3.66%	0.39%	12.79%	-16.83%
		(7.57%)	(10.39%)	(14.43%)	(25.68%)
Consumer Durables	68	-26.71%	18.27%	15.43%	-6.85%
		(14.54%)	(15.49%)	(20.31%)	(31.99%)
Consumer Nondurables	109	37.46%*	-17.87%	-15.63%	20.13%
		(18.63%)	(13.72%)	(15.00%)	(18.74%)
Consumer Services	257	-22.06%*	9.94%	14.76%	-9.61%
		(8.96%)	(8.03%)	(9.83%)	(13.82%)
Energy	89	-6.18%	0.57%	42.63%*	-77.92%*
		(8.29%)	(13.26%)	(19.05%)	(39.66%)
Finance	207	-30.37%**	6.47%	32.95%**	-10.26%
		(10.71%)	(9.29%)	(11.71%)	(15.71%)
Health Care	132	-20.44%	18.28%	-0.39%	-10.34%
		(11.15%)	(11.24%)	(13.84%)	(20.73%)
Miscellaneous	61	-8.81%	14.18%	-16.41%	7.93%
		(14.54%)	(15.82%)	(20.90%)	(37.18%)
Public Utilities	83	-10.92%	-33.50%*	41.59%*	15.48%
		(25.23%)	(16.11%)	(16.82%)	(22.14%)
Technology	225	3.19%	-7.48%	13.70%	-24.47%
		(5.43%)	(8.22%)	(12.06%)	(24.37%)
Transportation	34	-21.90%	18.66%	-1.27%	23.19%
		(19.82%)	(21.87%)	(28.78%)	(43.58%)

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S10. Annual Analyses for S&P 1500. This table reports the percent differences between the simulated expected numbers of companies with zero, one, two, or three women on their boards and the observed numbers of companies with zero, one, two, or three women on their boards (or the "excess percentage of boards observed with a given number of female directors") in the S&P 1500 from 2007 to 2013 with standard deviations based on 1,000 simulations reported in parentheses. Each year was analyzed separately for simulation purposes, and we trimmed the data in each year to remove companies with outlier numbers of board seats (i.e. less than six or more than fourteen).

Year	Number of Boards	Excess Percentage of Boards Observed with 0 Female Directors	Excess Percentage of Boards Observed with 1 Female Director	Excess Percentage of Boards Observed with 2 Female Directors	Excess Percentage of Boards Observed with 3 Female Directors
2007	1,343	-2.74%	-0.54%	14.07%**	-24.98%**
		(2.68%)	(3.50%)	(4.54%)	(7.92%)
2008	1,374	-3.26%	-1.79%	16.69%***	-19.62%*
		(2.78%)	(3.45%)	(4.50%)	(8.03%)
2009	1,396	0.13%	-4.93%	14.13%**	-12.34%
		(2.75%)	(3.48%)	(4.57%)	(7.95%)
2010	1,395	-2.59%	-1.07%	11.86%*	-16.50%*
		(2.94%)	(3.41%)	(4.62%)	(7.57%)
2011	1,396	-4.95%	0.27%	15.48%***	-23.38%**
		(2.94%)	(3.39%)	(4.51%)	(7.24%)
2012	1,429	-5.42%	0.76%	10.89%*	-7.70%
		(3.19%)	(3.40%)	(4.35%)	(6.80%)
2013	1,441	-8.06%*	1.92%	11.56%**	-8.30%
		(3.43%)	(3.44%)	(4.36%)	(6.48%)

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S11. Annual Analyses of S&P 500. This table reports the percent differences between the simulated expected numbers of companies with zero, one, two, or three women on their boards and the observed numbers of companies with zero, one, two, or three women on their boards (or the "excess percentage of boards observed with a given number of female directors") in the S&P 500 from 2007 to 2013 with standard deviations based on 1,000 simulations reported in parentheses. Each year was analyzed separately for simulation purposes, and we trimmed the data in each year to remove companies with outlier numbers of board seats (i.e. less than six or more than fourteen).

Year	Number of Boards	Excess Percentage of Boards Observed with 0 Female Directors	Excess Percentage of Boards Observed with 1 Female Director	Excess Percentage of Boards Observed with 2 Female Directors	Excess Percentage of Boards Observed with 3 Female Directors
2007	442	-30.40%***	6.69%	41.14%***	-41.06%***
		(7.27%)	(6.32%)	(7.56%)	(11.18%)
2008	461	-34.13%***	3.13%	44.60%***	-29.02%**
		(7.94%)	(6.14%)	(7.45%)	(9.66%)
2009	463	-30.60%***	2.42%	39.14%***	-22.24%*
		(7.58%)	(6.07%)	(7.48%)	(10.45%)
2010	467	-37.07%***	9.33%	32.28%***	-19.88%*
		(8.08%)	(6.27%)	(7.22%)	(9.76%)
2011	466	-39.93%***	5.64%	41.89%***	-27.26%**
		(8.37%)	(6.14%)	(7.28%)	(9.52%)
2012	474	-36.01%***	-4.02%	46.21%***	-13.47%
		(8.58%)	(6.40%)	(7.33%)	(9.45%)
2013	478	-45.08%***	-4.44%	45.31%***	-8.98%
		(9.72%)	(6.52%)	(7.20%)	(8.97%)

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S12. CEO Gender Robustness Check. This table reports the percent differences between the simulated expected numbers of companies with zero, one, two, or three women on their boards and the observed numbers of companies with zero, one, two, or three women on their boards (or the "excess percentage of boards observed with a given number of female directors") in the S&P 1500 in 2013 segmented by the gender of the CEO of the company with standard deviations based on 1,000 simulations reported in parentheses. Companies with female CEOs were analyzed separately from companies with male CEOs for simulation purposes, and we trimmed the data to remove companies with outlier numbers of board seats (i.e. less than six or more than fourteen).

CEO Gender	Number of Boards	Excess Percentage of Boards Observed with 0 Female Directors	Excess Percentage of Boards Observed with 1 Female Director	Excess Percentage of Boards Observed with 2 Female Directors	Excess Percentage of Boards Observed with 3 Female Directors
Female	58	n/a^	-43.02%*	39.60%*	-26.19%
		(n/a)	(21.41%)	(17.16%)	(20.61%)
Male	1,383	-9.26%**	3.32%	11.53%*	-6.10%
		(3.33%)	(3.50%)	(4.48%)	(6.90%)

^all female CEOs are on boards of their respective companies

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S13. IPO Year Robustness Check. This table reports the percent differences between the simulated expected numbers of companies with zero, one, two, or three women on their boards and the observed numbers of companies with zero, one, two, or three women on their boards (or the "excess percentage of boards observed with a given number of female directors") in the S&P 1500 in 2013 segmented by their IPO dates with standard deviations based on 1,000 simulations reported in parentheses. We trimmed the data to remove companies with outlier numbers of board seats (i.e. less than six or more than fourteen). Companies were ordered by IPO date and grouped into bins of 100 companies; given that there are 1,441 companies total in the trimmed dataset, the last bin contains 141 companies. Each bin was analyzed separately for simulation purposes.

Bin	IPO Date Range	Number of Boards	Excess Percentage of Boards Observed with 0 Female Directors	Excess Percentage of Boards Observed with 1 Female Director	Excess Percentage of Boards Observed with 2 Female Directors	Excess Percentage of Boards Observed with 3 Female Directors
1	≤ 1961	100	-66.76%*	-20.15%	49.90%**	20.36%
			(27.30%)	(16.02%)	(15.31%)	(18.08%)
2	1961 - 1972	100	-13.47%	-16.62%	39.59%*	-12.80%
			(16.90%)	(13.62%)	(16.57%)	(21.53%)
3	1972 - 1980	100	-22.38%	10.92%	26.60%	-33.43%
			(17.55%)	(13.65%)	(15.96%)	(21.32%)
4	1980 - 1983	100	-39.05%*	-3.64%	41.38%**	4.43%
			(15.28%)	(12.86%)	(14.96%)	(21.46%)
5	1983 - 1985	100	-26.42%	26.68%*	15.10%	-50.75%*
			(14.36%)	(13.50%)	(16.26%)	(23.47%)
6	1985 - 1988	100	5.91%	-10.44%	27.82%	-39.07%
			(12.25%)	(12.66%)	(16.27%)	(26.73%)
7	1988 - 1992	100	-11.61%	1.37%	5.72%	15.13%
			(11.48%)	(13.27%)	(17.19%)	(26.82%)
8	1992 - 1993	100	44.40%***	-21.28%	-2.78%	-20.81%
			(11.95%)	(12.50%)	(16.16%)	(25.88%)
9	1993 - 1995	100	-22.47%**	-11.35%	61.36%***	30.52%
			(7.56%)	(12.27%)	(17.72%)	(39.40%)
10	1995 - 1997	100	2.68%	22.98%	-20.58%	-58.67%
			(10.43%)	(12.95%)	(17.44%)	(31.54%)

11	1997 - 1999	100	-28.24%**	5.59%	14.96%	57.07%*
			(10.14%)	(12.57%)	(16.82%)	(28.84%)
12	1999 - 2003	100	-3.82%	15.34%	-18.52%	-3.33%
			(13.50%)	(12.97%)	(15.58%)	(23.35%)
13	2003 - 2006	100	-22.74%*	34.89%**	-18.11%	-10.27%
			(9.25%)	(12.63%)	(16.77%)	(31.02%)
14	≥ 2006	141	-3.25%	4.59%	-7.85%	0.44%
			(9.66%)	(10.79%)	(13.92%)	(24.28%)

*, **, and *** denote significance at the 5%, 1%, and 0.1% levels, respectively

Table S14. Regression discontinuity test predicting the selection of a woman to serve on a corporate board in laboratory experiment.

	B	*SE B*
Number of Women on Original Board	-0.101	(0.087)
One Woman Condition	0.454*	(0.215)
Observations	479	
Pseudo-R^2	0.0114	

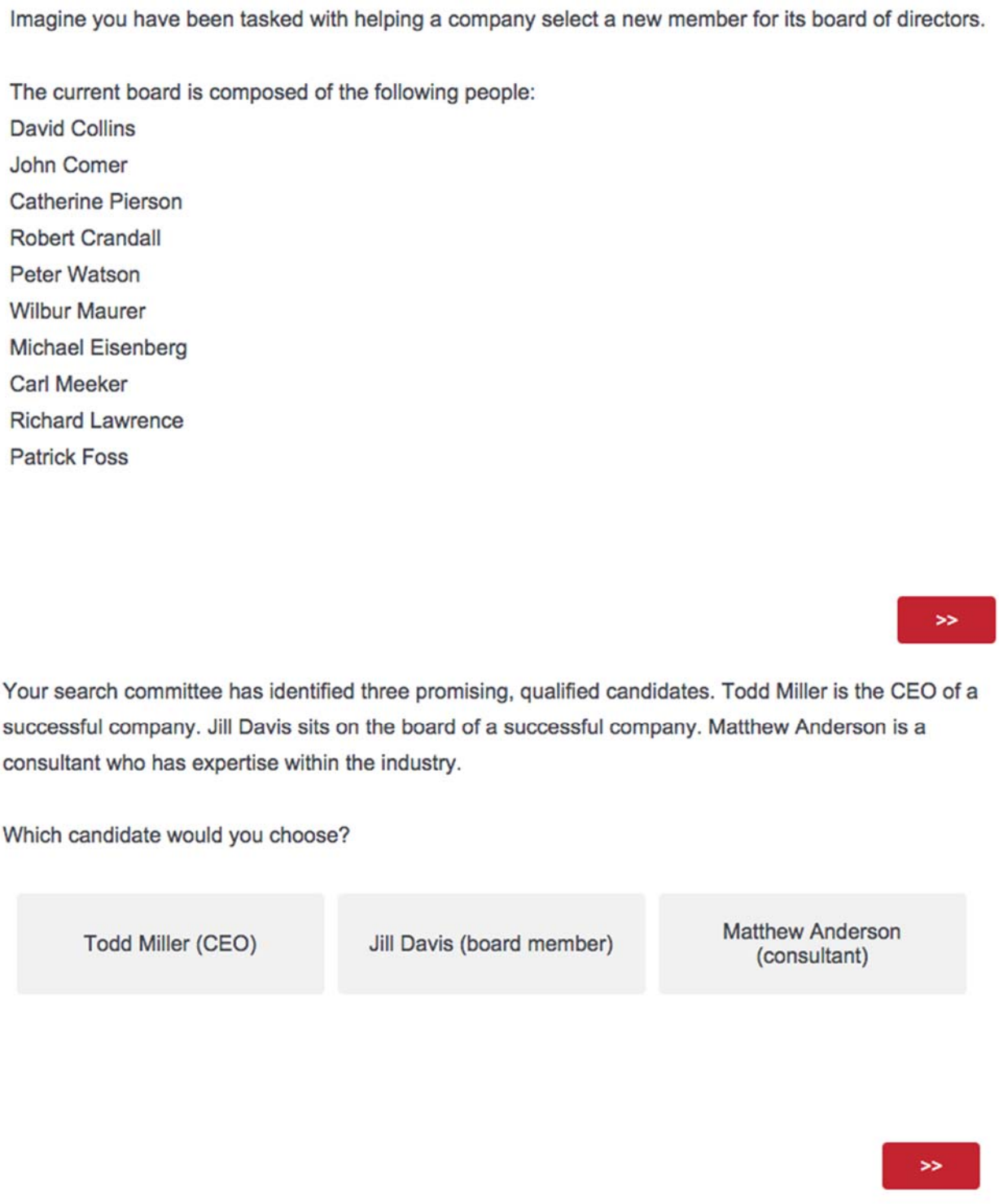
Note. This logistic regression depicts the discontinuous effect of the *one woman condition* on participants' likelihood of selecting a woman to serve on a corporate board after controlling for the continuous impact of the original number of women they were exposed to on the board in question. Standard errors are in parentheses. * $p < .05$.

APPENDIX S1. List of Variables for ISS Dataset.

Director - Age
Attended < 75% of Meetings
Audit Committee Member
Business Transaction?
Corporate Gov. Committee Member
Charity Relationship?
Board affiliation (E-employee/insider; I-Independent; L-linked; NA-not ascertainable)
New Company ID
Compensation Committee Member
Country of Employment
CUSIP
Designated Director?
IRRC Director ID
Year Service Began
Employment title - CEO
Employment title - CFO
Employment title - Chairman
Employment title - COO
Employment title - Executive VP
Employment title - President
Employment title - Secretary
Employment Title - if Executive of Subsidiary
Employment title - Senior VP
Employment title - Treasurer
Employment title - Vice-Chairman
Employment title - VP
Ethnicity
Exchange Type
Female?
Financial Expertise?
Director - First Name
Former Employee?
Director - Full Name
Grand-fathered on retire/tenure policy - [No longer collected]
S&P - Index
Interlocking Directorship?
Director - Last Name
Meeting date
Meeting Month
Company Name
Nominee
Nominating Committee Member
Non-CEO Leader Type
Shares held
Other Affiliation

Other Employment Title
# of Other Major Company Boards
Director holds <1% Voting Power?
Percent control of voting power
Primary Company Name
Prior service on board - [No longer collected]
Employment Category
Prof Services?
Relation to Employee?
Relative?
IRRC Company ID
Succ Cmte/Plan
TICKER
Type of Services
Data Year
Year of Termination
Year Service Ends

APPENDIX S2. Screenshots of Survey.



Why did you choose to add that candidate to the board?

>>

Please consider the corporate board you just viewed that is about to add a new member. Please rate the following statements on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree) about the existing corporate board (prior to the addition of a new member).

	1 - Strongly Disagree	2	3	4	5	6	7 - Strongly Agree
This corporate board has a high degree of gender diversity	○	○	○	○	○	○	○
I consider this corporate board to be gender diverse	○	○	○	○	○	○	○
This corporate board has very little gender diversity	○	○	○	○	○	○	○

>>

What is your gender?

Male

Female

What is your ethnicity?

Asian

Black

Caucasian

Hispanic

Other

What is your age?

What is your family's combined annual household income?

What is the highest level of education you have completed?

How many years of full-time work experience do you have?

Roughly how many hours per week do you currently work?

>>

How many men were on the corporate board presented at the beginning of the survey?

How many women were on the corporate board presented at the beginning of the survey?

>>